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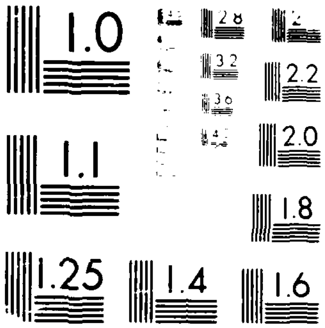
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INSTALLATION RESTORATION PROGRAM RECORDS SEARCH

AD-A191 021

For Air Force Plant 85, Ohio

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CH2M HILL

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Prepared for

AIR FORCE ENGINEERING AND SERVICES CENTER
DIRECTORATE OF ENVIRONMENTAL PLANNING
TYNDALL AIR FORCE BASE, FLORIDA 32403
AND
AIR FORCE SYSTEMS COMMAND
AERONAUTICAL SYSTEMS DIVISION
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This report provides the Installation Restoration Program (IRP) Phase I-Records Search for Air Force Plant 85, Columbus, Ohio. This is a report of a study conducted to identify past potentially hazardous material disposal sites. Interviews and document searches were condcuted to determine sites that were potentially contaminated.

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INSTALLATION RESTORATION
PROGRAM RECORDS SEARCH

FOR

AIR FORCE PLANT 85, OHIO

Prepared for

AIR FORCE ENGINEERING AND SERVICES CENTER
DIRECTORATE OF ENVIRONMENTAL PLANNING
TYNDALL AIR FORCE BASE, FLORIDA 32403

AND

AIR FORCE SYSTEMS COMMAND
AERONAUTICAL SYSTEMS DIVISION
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

Prepared by

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Gainesville, Florida

February 1984

Contract No. F08637-80-G0010-5004

NOTICE

This report has been prepared for the United States Air Force by CH2M HILL SOUTHEAST, INC., for the purpose of aiding in the implementation of the Air Force Installation Restoration Program. It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force, nor the Department of Defense.

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

A. INTRODUCTION

1. CH2M HILL was retained on June 24, 1983, to conduct the Air Force (AF) Plant 85 records search under Contract No. F08637-80-G0010-5004, with funds provided by Aeronautical Systems Division (ASD).

2. Department of Defense (DoD) policy, directed by Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites on DoD facilities, control the migration of hazardous contamination from such facilities, and control hazards to health and welfare that may have resulted from these past operations.

3. To implement the DoD policy, a four-phase Installation Restoration Program has been directed. Phase I, the records search, is the identification of potential problems. Phase II (not part of this contract) consists of follow-on field work to determine the extent and magnitude of contaminant migration. Phase III (not part of this contract) consists of technology base development (evaluation of alternatives for remedial action) to support the development of project plans for controlling migration or restoring the installation. Phase IV (not part of this contract) includes those efforts which are required to control identified hazardous conditions.

4. The AF Plant 85 records search included a detailed review of pertinent installation records, contacts with government organizations for documents relevant to the records search effort, and an onsite installation visit conducted by CH2M HILL during the week of October 31 through November 3, 1983. Activities conducted during the onsite visit included interviews with 25 installation employees, ground tours of installation facilities, and a detailed search of installation records to identify past disposal areas.

B. MAJOR FINDINGS

1. The majority of industrial operations at AF Plant 85 have been in existence since 1941. The installation initially produced naval aircraft during World War II under contract with the Curtiss-Wright Corporation. In 1950, the installation became the Naval Industrial Reserve Aircraft Plant (NIRAP) Columbus under contract with North American Aviation (now Rockwell International). The plant was transferred to the jurisdiction of the Air Force in 1982, and was redesignated AF Plant 85.

2. The major industrial operations have been related to the final assembly, flight acceptance testing, and modification of jet aircraft. The major industrial operations include machining and forming, metal finishing and electroplating, painting and coating, small parts assembly, and aircraft and missile subassembly. These industrial operations generate varying quantities of waste oils, spent solvents, stripper, and cleaners. The total quantity of waste oils, spent

solvents, stripper, and cleaners generated ranges from 220,000 to 230,000 gallons per year. Of this total quantity, approximately 90,000 gallons consists of non-hazardous milling coolant oil and 73,000 gallons of non-hazardous paint sludges. This range of total waste quantities is based on current (1983) estimates. Waste quantities are dependent on contractor workload and may vary greatly from one time period to the next and have been greater in the past.

3. In general, the standard procedures for past and present industrial waste disposal practices have been: (1) combined fire department training exercises and contract removal off AF Plant 85 for final disposition (1941 to 1965), and (2) combined fire department training exercises, contract removal offsite, and industrial wastewater treatment (1965 to present). More specific industrial waste disposal practices for each industrial site are summarized in Section IV.A.1, "Summary of Industrial Waste Disposal Practices."

4. Interviews with installation employees resulted in the identification of nine past disposal or spill sites at AF Plant 85 and the approximate dates that these sites were active (see Figure 1 for site locations).

C. CONCLUSIONS

1. Information obtained through interviews with installation personnel, installation records, and field observations indicate that hazardous wastes have been disposed of or spilled on AF Plant 85 property in the past.

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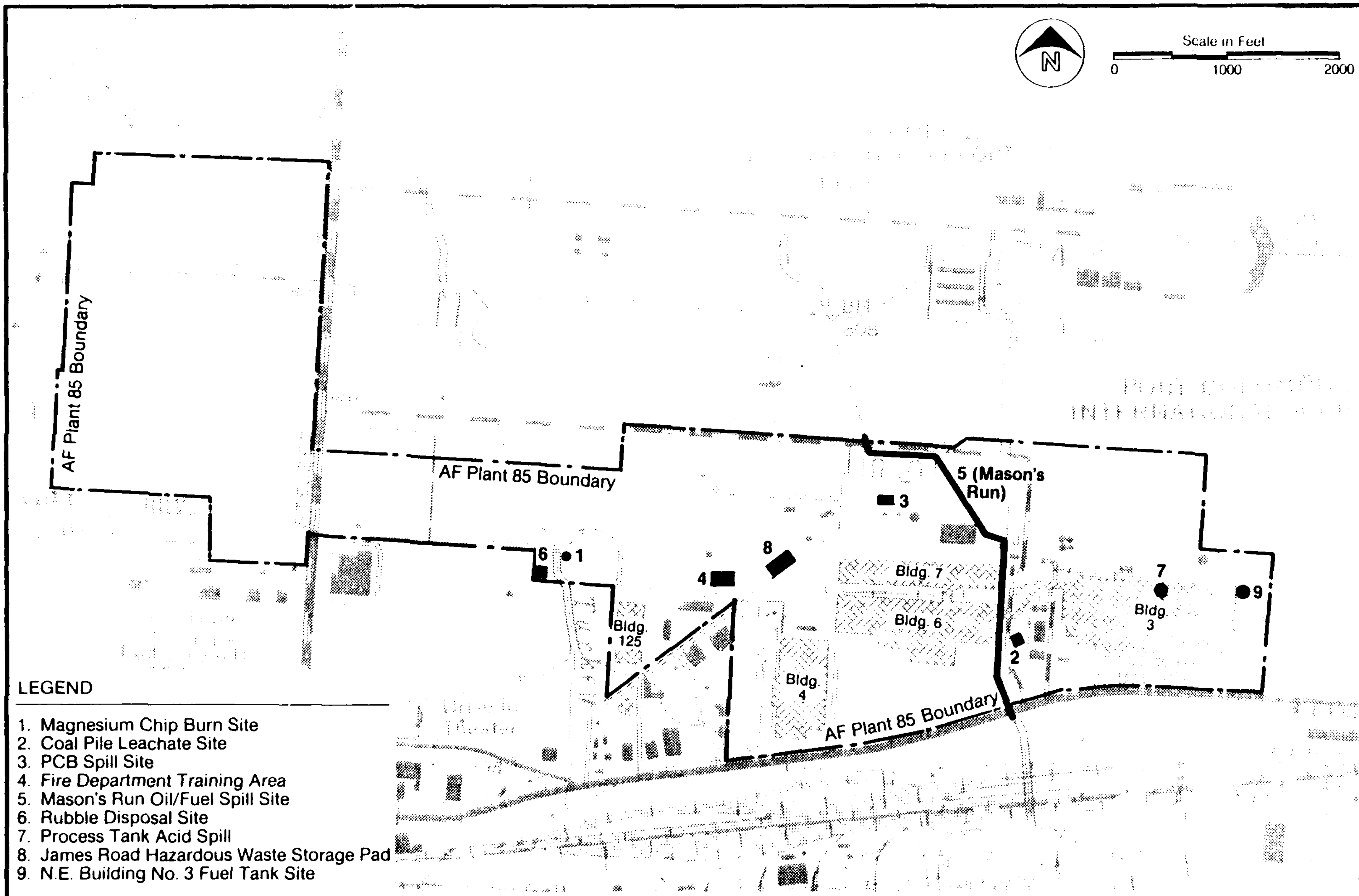

FIGURE 1.
Location Map of Identified Disposal and Spill Sites at AF Plant 85.

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2. No evidence of environmental stress resulting from past disposal of hazardous wastes was observed at AF Plant 85.

3. Indirect evidence (confirmed by visual observation of oil sheen) of contaminant migration exists at Site No. 5, Mason's Run Oil/Fuel Spill Site.

4. The potential for surface-water migration of hazardous contaminants is relatively high at AF Plant 85 due to the relatively high annual precipitation, the low permeability of the site soils, the extensive paved areas, the resulting high stormwater runoff, the extensive stormwater drainage system, and proximity to surface drainages.

5. The potential for ground-water migration of hazardous contamination is moderately low, due primarily to the moderately low soil permeabilities, extensive paved areas, and moderately deep ground-water table. The potential exists, however, due to the absence of a continuous confining stratum and the presence of numerous abandoned wells developed in a buried channel filled with glacial outwash. The potential is higher in areas such as storm drainage ditches (Mason's Run) or the past fire department training area.

6. Table 1 presents a prioritized listing of the rated waste disposal or spill sites and their overall scores. The following sites were designated as areas showing the most significant potential (relative to other AF Plant 85 sites) for environmental impact.

Table 1
PRIORITIZED LISTING OF DISPOSAL AND SPILL SITES

Ranking No.	Site No.	Description	Overall Harm Score
1	5	Mason's Run Oil/Fuel Spill Site	62
2	4	Fire Department Training Area	57
3	8	James Road Hazardous Waste Storage Pad	56
4	3	PCB Spill Site	55
5	2	Coal Pile Leachate Site	51
6	9	N.E. Building No. 3 Fuel Tank Site	50

a. Site No. 5, Mason's Run Oil/Fuel Spill Site

b. Site No. 4, Fire Department Training Area

c. Site No. 8, James Road Hazardous Waste Storage Pad

d. Site No. 3, PCB Spill Site

e. Site No. 2, Coal Pile Leachate Site

f. Site No. 9, N.E. Building No. 3 Fuel Tank Site.

7. The remaining sites, as well as the sites that were not rated, are not considered to present significant environmental concerns.

D. <u>RECOMMENDATIONS</u>

1. A limited Phase II monitoring program is recommended to confirm or rule out the presence and/or migration of hazardous contaminants. The priority for monitoring at those sites on the prioritized list (see Table 1) is considered moderate. The limited Phase II program includes sediment, surface water, and ground-water sampling at Site No. 5, Mason's Run Oil/Fuel Spill Site, soil sampling at Site No. 4, Fire Department Training Area and at Site No. 8, James Road Hazardous Waste Storage Pad, and ground-water sampling at Site No. 3, Coal Pile Leachate Site. The recommended preliminary sampling locations are shown in Figure 2. Sampling and analysis are already underway at Site No. 3, PCB Spill Site. A more complete description of the limited Phase II

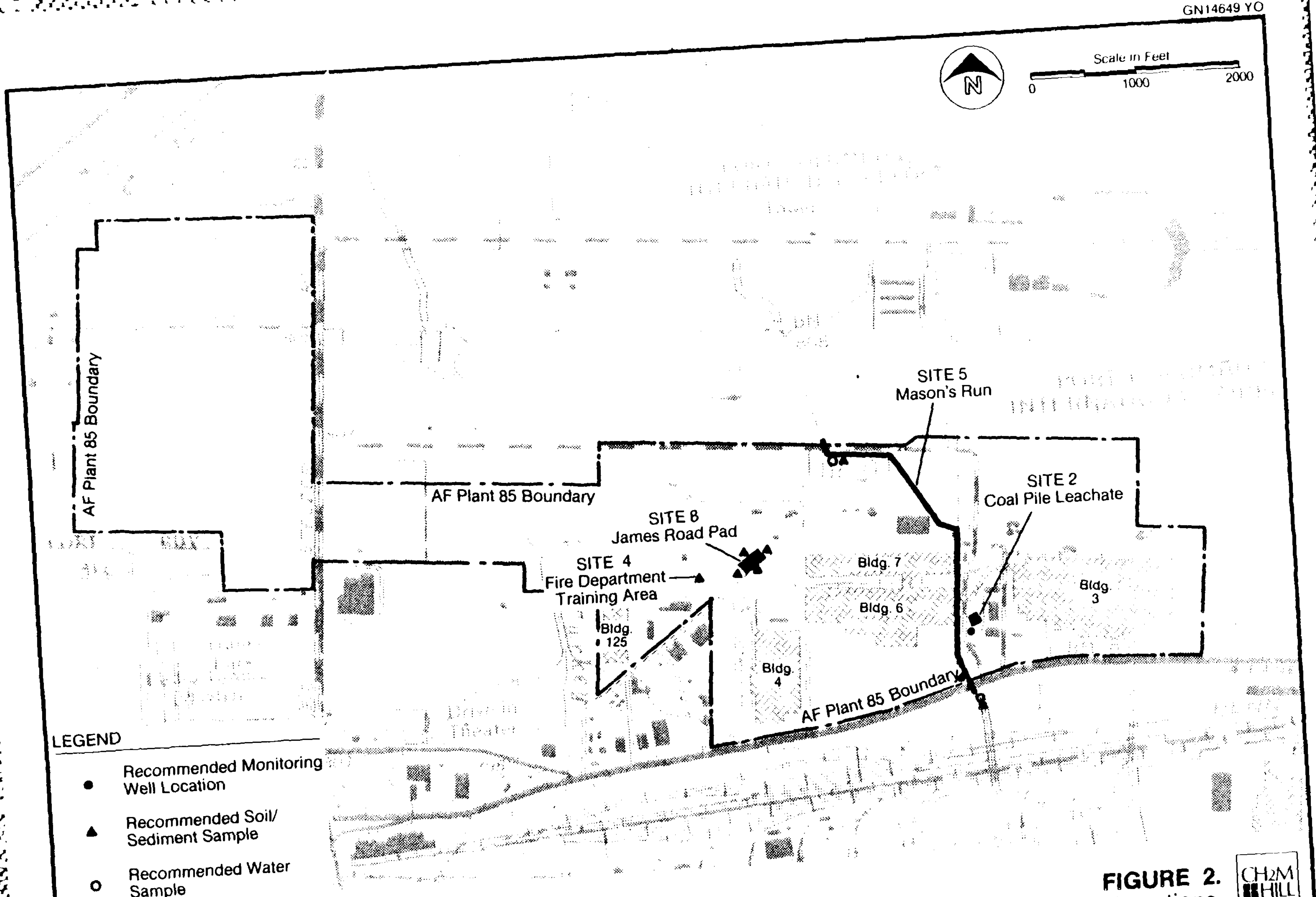

FIGURE 2.
Recommended Preliminary Sampling Locations.

program recommended at AF Plant 85 is provided in Section VI. Preliminary locations for the recommended monitoring are shown in Figure 2.

2. The final details of the monitoring program, including the exact locations of sampling points, should be determined as part of the Phase II program. In the event that contaminants at levels of serious concern are detected, a more extensive field survey program should be implemented to determine the extent of contaminant migration.

3. Other environmental recommendations that have resulted from the installation site visit and records search are presented below:

   a. The integrity of the five underground tanks located at Site No. 9, N.E. Building No. 3 Fuel Tank Site, should be determined (e.g., by pressure testing for leaks).

   b. The integrity of the two underground tanks located at the Oil House which have been used in the past for storage of TCE and TCE sludge (Tanks No. 146 and 147) should be determined (e.g., by pressure testing for leaks).

   c. The removal efficiency of the oil skimmer located at Mason's Run should be determined, and improved, if necessary.

   d. A sampling protocol should be developed for Mason's Run in the event of an accidental spill.

I. INTRODUCTION

I. INTRODUCTION

A. BACKGROUND

The United States Air Force (USAF), due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner.

The Department of Defense (DoD) developed the Installation Restoration Program (IRP) to ensure compliance with hazardous waste regulations. The current DoD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Headquarters Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the IRP. DoD policy is to identify and fully evaluate suspected problems associated with past hazardous material contamination, and to control hazards to health and welfare that may have resulted from these past operations. The IRP will be the basis for assessment and response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as by Executive Order 12316 and provisions of Subpart F of 40 CFR 300 (National Contingency Plan). CERCLA is the primary Federal legislation governing remedial actions at uncontrolled hazardous waste sites.

To conduct the IRP Hazardous Materials Disposal Sites Records Search for Air Force (AF) Plant 85 in Columbus, Ohio, CH2M HILL was retained on June 24, 1983, under

Contract No. F08637-80-G0010-5004 with funds provided by Aeronautical Systems Division (ASD). The location of AF Plant 85 is shown in the Vicinity Map (Figure 3).

The records search constitutes Phase I of the DoD IRP and is intended to review installation records for the purpose of identifying possible hazardous waste-contaminated sites and assessing the potential for contaminant migration. Phase II (not part of this contract) consists of follow-on field work as determined from Phase I. Phase II consists of the necessary field work to confirm the extent of the contamination. Phase III (not part of this contract) consists of technology base development to support the development of project plans for controlling migration or restoring the installation. Phase IV (not part of this contract) includes those efforts which are required to control identified hazardous environmental conditions.

B. AUTHORITY

The identification of hazardous waste disposal sites at Air Force installations was directed by Defense Environmental Quality Program Policy Memorandum 81-5 (DEQPPM 81-5) dated 11 December 1981, and implemented by Headquarters Air Force message dated 21 January 1982, as a positive action to ensure compliance of Air Force installations with existing environmental regulations.

C. PURPOSE OF THE RECORDS SEARCH

The purpose of the Phase I records search is to identify and evaluate suspected problems associated with past hazardous material disposal sites and spill sites on DoD facilities. The existence and potential for migration of hazardous material contaminants were evaluated at AF

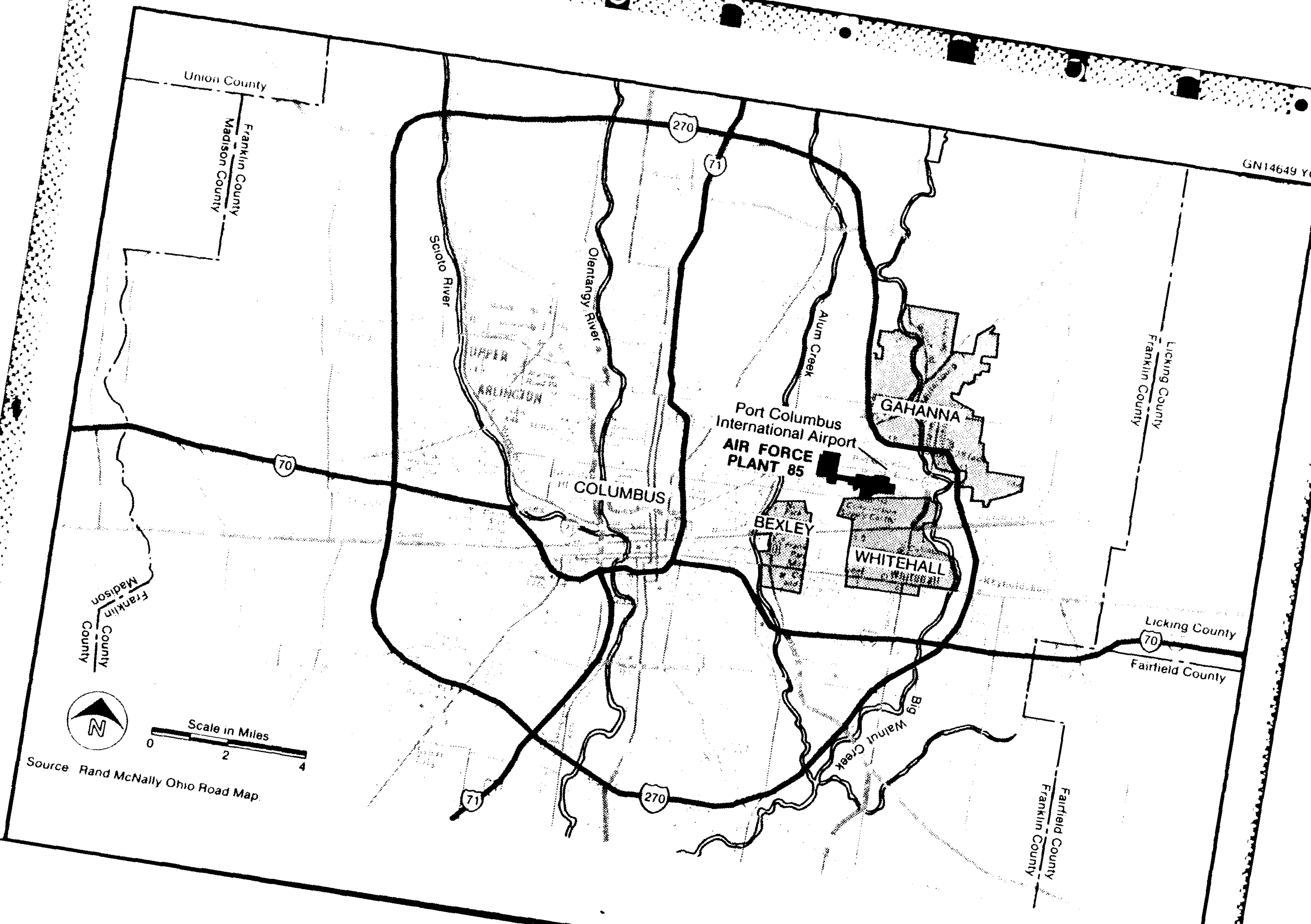

FIGURE 3.
Vicinity Map of AF Plant 85.

Plant 85 by reviewing the existing information and conducting an analysis of installation records. Pertinent information included the history of operations, the geological and hydrogeological conditions which may have contributed to the migration of contaminants, and the ecological settings which indicated environmentally sensitive habitats or evidence of environmental stress. The evaluation is to determine which identified sites, if any, exhibit a significant potential for health or environmental impact to warrant further investigation. Sampling is not conducted during Phase I. If required, sampling will be conducted during Phase II.

D. SCOPE

The records search program included a pre-performance meeting, an onsite installation visit, a review and analysis of the information obtained, and preparation of this report.

The pre-performance meeting was held at AF Plant 85, Columbus, Ohio, on August 3, 1983. Attendees at this meeting included representatives of the Air Force Engineering and Services Center (AFESC), Aeronautical Systems Division (ASD), Air Force Logistics Command (AFLC), Air Force Systems Command (AFSC), Air Force Plant 85, and Rockwell International. The purpose of the pre-performance meeting was to provide detailed project instructions, to provide clarification and technical guidance by AFESC, and to define the responsibilities of all parties participating in the AF Plant 85 records search.

The onsite installation visit was conducted by CH2M HILL from October 31 through November 3, 1983. Activities performed during the onsite visit included a detailed search of installation records, ground tours, a

plant facilities tour, and interviews with installation personnel. At the conclusion of the onsite visit, representatives from AFPRO and Rockwell International were briefed on the preliminary findings. The CH2M HILL records search team included the following individuals:

1. Mr. Bruce Haas, Project Manager/Geotechnical Engineer (M.S. Civil Engineering, 1976).

2. Mr. Thomas Ridgik, Assistant Project Manager/ Environmental Engineer (M.S., Environmental Engineering, 1981).

3. Mr. Thomas Emenhiser, Chemist (B.S. Chemistry, 1974).

Resumes of these team members are included in Appendix A.

Government organizations were contacted for information and relevant documents. Appendix B lists the organizations contacted.

Individuals from the Air Force who assisted in the AF Plant 85 records search include:

1. Capt. Gail Graban, AFESC, Program Manager, Phase I.

2. Mr. Charles Alford, ASD, Environmental Program Manager.

3. Lt. Col. Robert J. Pratt, AFPRO, Commander, AF Plant 85.

4. Mr. Tom Miller, AFPRO, Industrial Specialist, AF Plant 85.

E. METHODOLOGY

The methodology used in the AF Plant 85 records search is shown in Figure 4. First, a review of past and present industrial operations was conducted at the installation. Information was obtained from available records such as contractor files and real property files, as well as interviews with employees from the various operating areas of the installation. The information obtained from interviewees on past activities was based on their best recollection. A list of the 25 interviewees from AF Plant 85, with areas of knowledge and years at the installation, is presented in Appendix C.

The next step in the activity review process was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from all the industrial operations on the base. This part of the activity review included the identification of any landfill or burial sites, as well as other possible sources of contamination such as major PCB or solvent spills, or fuel-saturated areas resulting from significant fuel spills or leaks.

The records search team then conducted a general ground tour of identified sites to gather site-specific information including evidence of environmental stress and the presence of nearby drainage ditches or surface-water bodies. These water bodies were visually inspected for any evidence of contamination or leachate migration.

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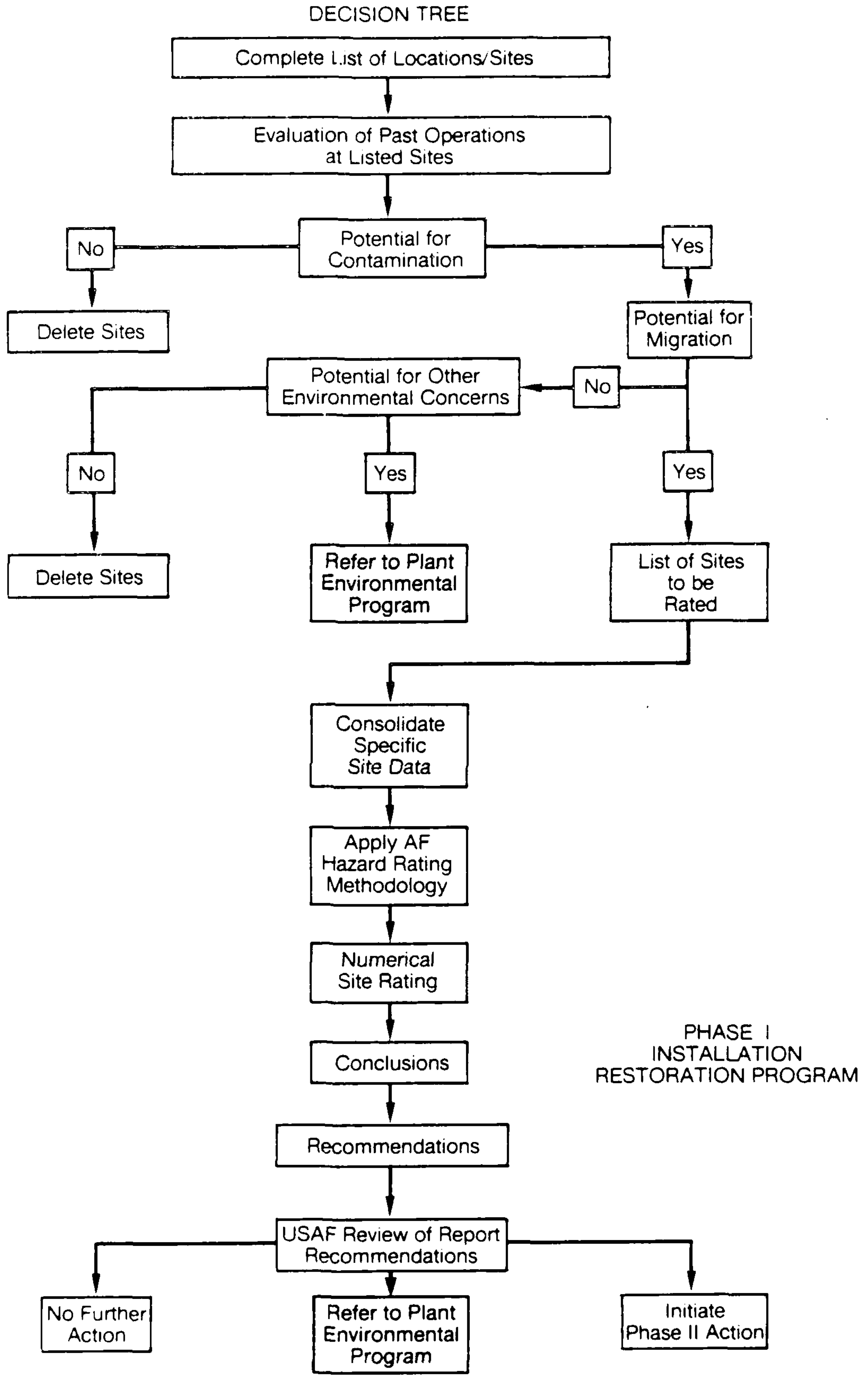

FIGURE 4.
Records Search Methodology.

A decision was then made, based on all of the above information, as to whether a potential exists for hazardous material contamination from any of the identified sites. If not, the site was deleted from further consideration.

For those sites at which a potential for contamination was identified, the potential for migration of this contamination was evaluated by considering site-specific soil and ground-water conditions. If no potential for contaminant migration existed, but other environmental concerns were identified, the site was referred to the installation environmental protection program. If no further environmental concerns were identified, the site was deleted from consideration. If a potential for contaminant migration was identified, then site-specific information was collected and the site was rated and prioritized using the site rating methodology described in Appendix G, "Hazard Assessment Rating Methodology."

The site rating indicates the relative potential for adverse environmental impact at each site. For those sites showing a significant potential, recommendations were made to conduct a more detailed investigation of the potential contaminant migration problem under Phase II of the Installation Restoration Program. For those sites showing a low potential, no Phase II work was recommended.

II. INSTALLATION DESCRIPTION

II. INSTALLATION DESCRIPTION

A. LOCATION

AF Plant 85 is located in Franklin County, Ohio, in the eastern portion of the City of Columbus, about 6 miles east-northeast of downtown Columbus. Nearby incorporated towns include Whitehall (adjacent to the installation to the south), Bexley (about one mile to the southwest), and Gahanna (about one mile to the north). A vicinity map of AF Plant 85 is shown in Figure 3, and a site map of the installation is shown in Figure 5.

The total land area included in AF Plant 85 consists of approximately 518.1 acres. The main industrial plant facilities are located on approximately 288.1 acres alongside 5th Avenue, south of the Port of Columbus airport. About 118.7 acres of the main plant area, including the areas of Building No. 3 and the North Ramp, are leased from the City of Columbus. Approximately 55.7 acres of land west of the main plant area were used as part of a former radar test range. The remaining 174.1 acres of AF Plant 85 are located west of Stelzer Road and contain the Instrument Landing System (ILS) operated by the Federal Aviation Administration (FAA).

B. ORGANIZATION AND MISSION

Construction of AF Plant 85 was begun in November 1940 and completed in December 1941 under the Defense Plant Corporation (PLANCOR). The plant produced naval aircraft during World War II under contract with the Curtiss-Wright Corporation. During World War II, the plant employed over 24,000 people and produced over 3,500 aircraft. Aircraft production declined substantially after the war, and Curtiss-Wright discontinued operations in 1950.

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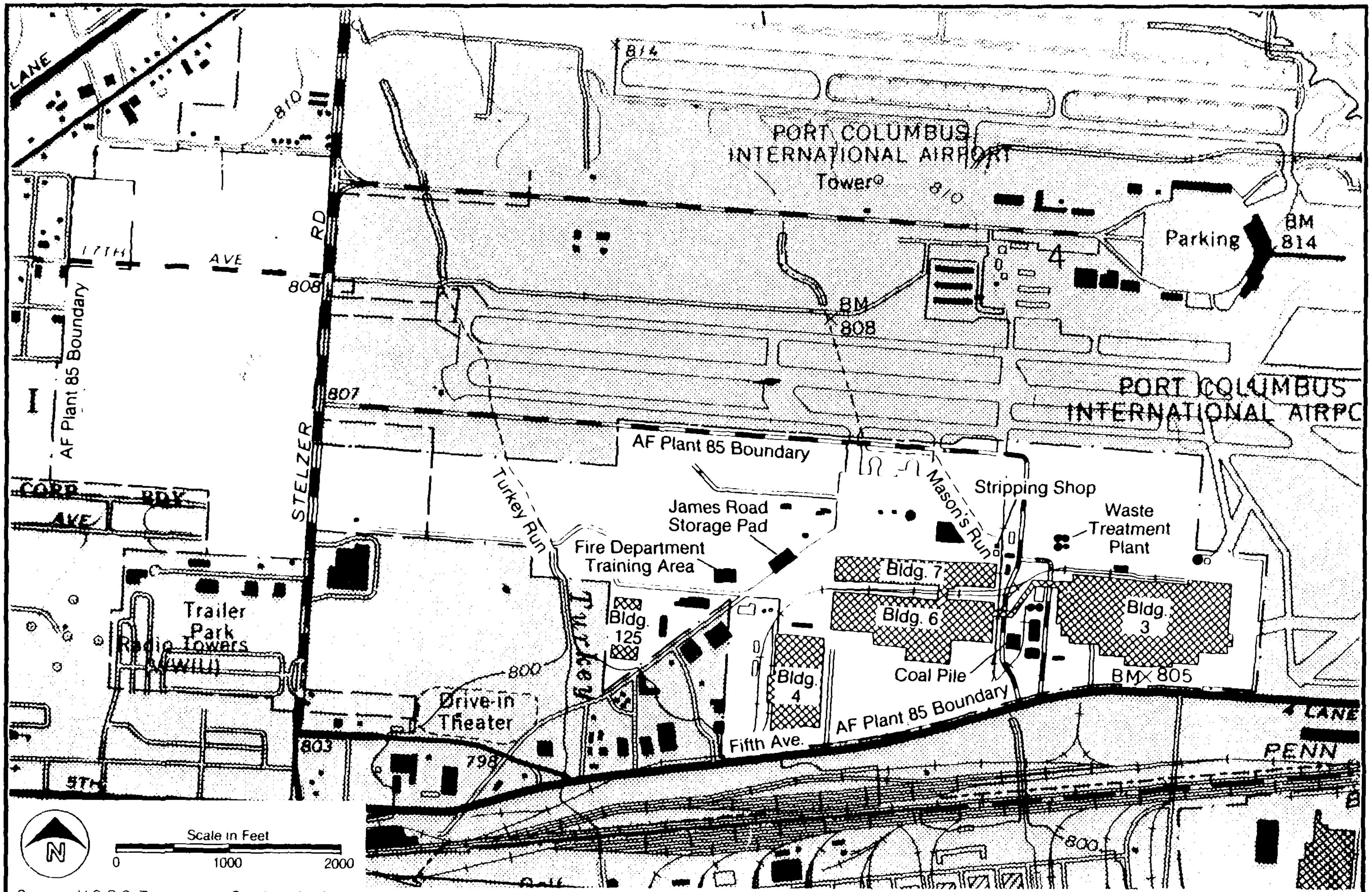

Source U S G S Topographic Quadrangle Map

FIGURE 5.
Site Map of AF Plant 85.

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In November 1950, the U.S. Navy took title of the plant from the PLANCOR, which became the Naval Industrial Reserve Aircraft Plant (NIRAP) Columbus. At that time, North American Aviation (now Rockwell International) began operations at the plant and was involved in the design, testing, and construction of numerous types of naval aircraft and missile systems. Aircraft production declined substantially during the 1970s, so that by 1979, less than 2,000 employees remained at the plant.

In 1982, production of the B-1B Bomber aircraft resumed under contract with Rockwell International. NIRAP Columbus was transferred from the jurisdiction of the Navy to the Air Force in 1982, and was redesignated AF Plant 85. Today the workload is still increasing; over 4,000 employees currently work at AF Plant 85. The plant produces the nacelles, forward-intermediate fuselage (FIF), and wing-carry-through (WCT) for the B-1B as well as components for the MX-Peacekeeper Missile and the space shuttle.

A more complete history of Air Force Plant 85 is presented in Appendix D.

The Air Force Plant Representative Office (AFPRO) is the host of AF Plant 85. AFPRO staff is responsible for contract administration, manufacturing operations, quality control functions, environmental programs, and administrative responsibilities. The primary mission is to provide for the common defense with an obligation to protect the taxpayer's investment in overseeing DoD contractors assigned to AF Plant 85.

III. ENVIRONMENTAL SETTING

III. ENVIRONMENTAL SETTING

A. METEOROLOGY

AF Plant 85 and the City of Columbus are located in an area of temperate continental climate and changeable weather conditions which are influenced by air masses from all directions. Air masses from central and northwest Canada frequently affect this region. Occasional weather changes occur due to cool outbreaks from the Hudson Bay Region, especially during the spring. Tropical Gulf masses often reach the area during the summer and, at infrequent intervals, the general circulation brings showers or snow from the Atlantic.

In January, Columbus has an average temperature of approximately 28°F with an average daily minimum of approximately 20°F. The lowest temperature on record is -19°F, which occurred in January 1977. The average date of the last freezing temperature in the spring is April 16 and the average date of the first freeze in the fall is October 31, although the area is subject to high local variation. In July, the average temperature is about 74°F with an average daily maximum of approximately 85°F. The highest recorded temperature is 102°F which occurred in June 1944.

Although Columbus does not have a "wet" or "dry" season as such, average precipitation is generally greater in the spring and early summer and lower in the fall. The average precipitation is about 37 inches per year and the average annual snowfall is about 28 inches per year. Thunderstorms occur on an average of 42 days each year, mostly in the summer. Mean annual lake evaporation, commonly used to estimate the mean annual evapotranspiration rate, is about

33 inches per year. Therefore, the annual net precipitation (mean annual precipitation minus mean annual evapotranspiration) is approximately 4 inches per year.

The prevailing wind is from the south-southwest; the monthly average wind speed is between approximately 7 and 10 miles per hour. The rolling landscape is conducive to air drainage at speeds generally less than 4 miles per hour.

Table 2 summarizes the meteorological data for AF Plant 85.

B. PHYSICAL GEOGRAPHY

1. Physiography and Topography

AF Plant 85 is located within the glaciated Till Plains of Central Ohio, a division of the Central Lowlands physiographic province. The ground surface is relatively flat and lacks the numerous lakes and swamps which characterize other glaciated areas. The only significant relief is present in areas adjacent to streams, glacial moraines, or resistant bedrock.

A series of north-south trending escarpments and terraces separate the Central Lowlands from the Appalachian Plateau east of Columbus. The lowest of these escarpments rises from an altitude of approximately 800 feet to an altitude of approximately 1,010 feet. Big Walnut Creek, located just east of AF Plant 85 (see Figure 3), is located near the base of this escarpment.

The principal stream in Franklin County is the Scioto River which flows southward through downtown Columbus toward the Ohio River. Tributary streams near AF Plant 85 include the Olengtangy River, Alum and Big Walnut Creeks

Table 2

METEOROLOGICAL DATA SUMMARY FOR AF PLANT 85, COLUMBUS, OHIO

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
Temperature (°F)													
Record High	74	73	85	89	94	102	100	100	100	90	80	76	102
Record Low	-19	-13	-2	14	25	35	43	39	31	20	5	-10	-19
Normal Maximum	36.4	39.2	49.3	62.8	72.9	81.9	84.8	83.7	77.6	66.4	50.9	38.7	62.1
Normal Minimum	20.4	21.4	29.1	39.5	49.3	58.9	62.4	60.1	52.7	42.0	32.4	22.7	40.9
Normal Mean	28.4	30.3	39.2	51.2	61.1	70.4	73.6	71.9	65.2	54.2	41.7	30.7	51.5
Precipitation (inches)													
Record Maximum (in 24 hours)	4.81	2.15	3.40	2.37	2.72	2.93	3.82	3.79	4.86	1.87	2.05	1.74	4.86
Normal Mean	2.87	2.32	3.44	3.71	4.10	4.13	4.21	2.86	2.41	1.89	2.68	2.39	37.01
Mean Snowfall	8.7	6.0	4.6	0.8	Trace	0.0	0.0	0.0	Trace	Trace	2.7	5.6	28.4

Period: 1939-1982.
Source: United States Department of Commerce, National Climatic Data Center.

which show a distinct north-south parallel alignment. Land elevations in the county are estimated to range from 1,130 feet above mean sea level (msl) in the northeast corner to 670 feet above msl along the southern border where the Scioto River leaves the county. The topography of AF Plant 85 is relatively flat, with elevations varying from 810 to 815 feet msl.

2. Bedrock Geology

The consolidated rocks which underlie the glacial deposits in Franklin County are sedimentary in origin and range in age from early Devonian to early Mississippian. The rocks consist of beds of dolomitic limestone, black shale, and alternating shale and sandstone and have an average dip of 20 to 30 feet per mile to the east. The principal rock units are listed in Table 3. Some of these rock units have been removed locally by erosion and are therefore absent in parts of the county. Figure 6 shows the areal distribution of the principal rock units. Figure 7 shows a geologic cross-section of the AF Plant 85 vicinity.

The oldest member of the Devonian system is the Rasin River Formation, a dolomitic limestone which is exposed in places in the western part of the county. The formations to the east are progressively younger and are situated above the Rasin River. They include the Columbus and Delaware limestones, and the Ohio and Olentangy shales. The younger Devonian limestones average about 140 feet in thickness and the Devonian shales average about 480 feet in thickness.

The Mississippian System is exposed in the valleys east of Big Walnut Creek. The formations include, from oldest to youngest, the Bedford shale, the Berea sandstone,

Table 3
GEOLOGIC FORMATIONS IN THE VICINITY OF AF PLANT 85
FRANKLIN COUNTY, OHIO

System	Series	Group or Formation	Maximum Thickness (feet)	Character of Material	Water-Bearing Properties
Quaternary	Recent (alluvium)			Silt, clay, and sand deposited on the flood plains of the major streams.	Thin and relatively impermeable.
	Pleistocene (glacial)	Later Stage, Wisconsin Period	50-100	Clayey till (glacial till)	Yields less than 2 gpm.
		Early Stage Wisconsin Period	0-350	Sand and gravel (glacial outwash) buried valleys. Layer of clayey till may be present below outwash.	Potential ground-water yields depend upon the thickness, regional extent, permeability, and source of recharge. Where favorable conditions prevail, wells may yield 1,000 to 1,500 gpm. Typically, wells yield 200 gpm. Where sand and gravel are present in thin scattered lenses interbedded with glacial till, yields are as low as 5 to 10 gpm.
		Illinoian Period	0-85	Lenses of fine sand in buried valleys.	Generally not a source of ground water. Usually low in permeability.
Mississippian		Cuyahoga	165	Alternating gray, sandy shale and blue to grayish sandstone.	Potential yields of up to 30 gpm from sandstone layers.
		Sunbury	35	Black shale.	Poor source of ground water.
		Berea	5-55	Gray to buff colored sandstone with some shale.	Potential yields of up to 25 gpm.
		Bedford	60-90	Brown to gray shale.	Poor source of ground water.

Table 3--Continued

System	Series	Group or Formation	Maximum Thickness (feet)	Character of Material	Water-Bearing Properties
		Ohio	450	Black shale.	Poor source of ground water.
		Olentangy	30	Blue shale with some limestone concretions.	Poor source of ground water.
		Delaware	32	Blue-gray limestone with some thin shaley layers, iron pyrites and black chert.	Small supplies of up to 3 gpm.
Devonian		Columbus	105	Brown to light gray porous limestone.	The principal bedrock aquifer in the county for farm, domestic, small municipal and industrial supplies. Yields up to 175 gpm.
		Rasin River	373	Dolomitic limestone.	Most important industrial bedrock aquifer. Yields up to 400 gpm or more, usually highly mineralized.

Source: Bulletin 30, Ohio Department of Natural Resources.

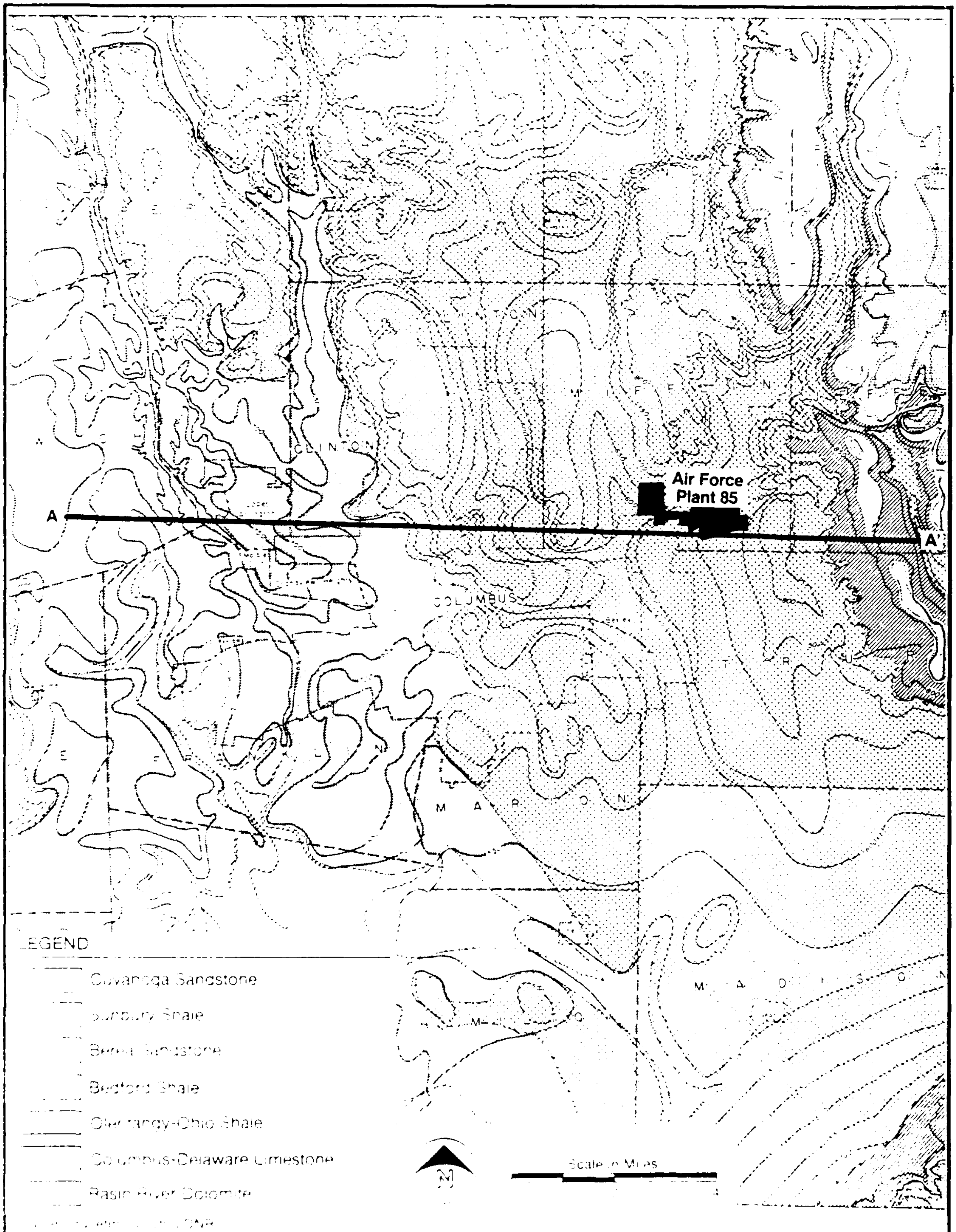

FIGURE 6. Geologic Subcrop Map of AF Plant 85 Vicinity.

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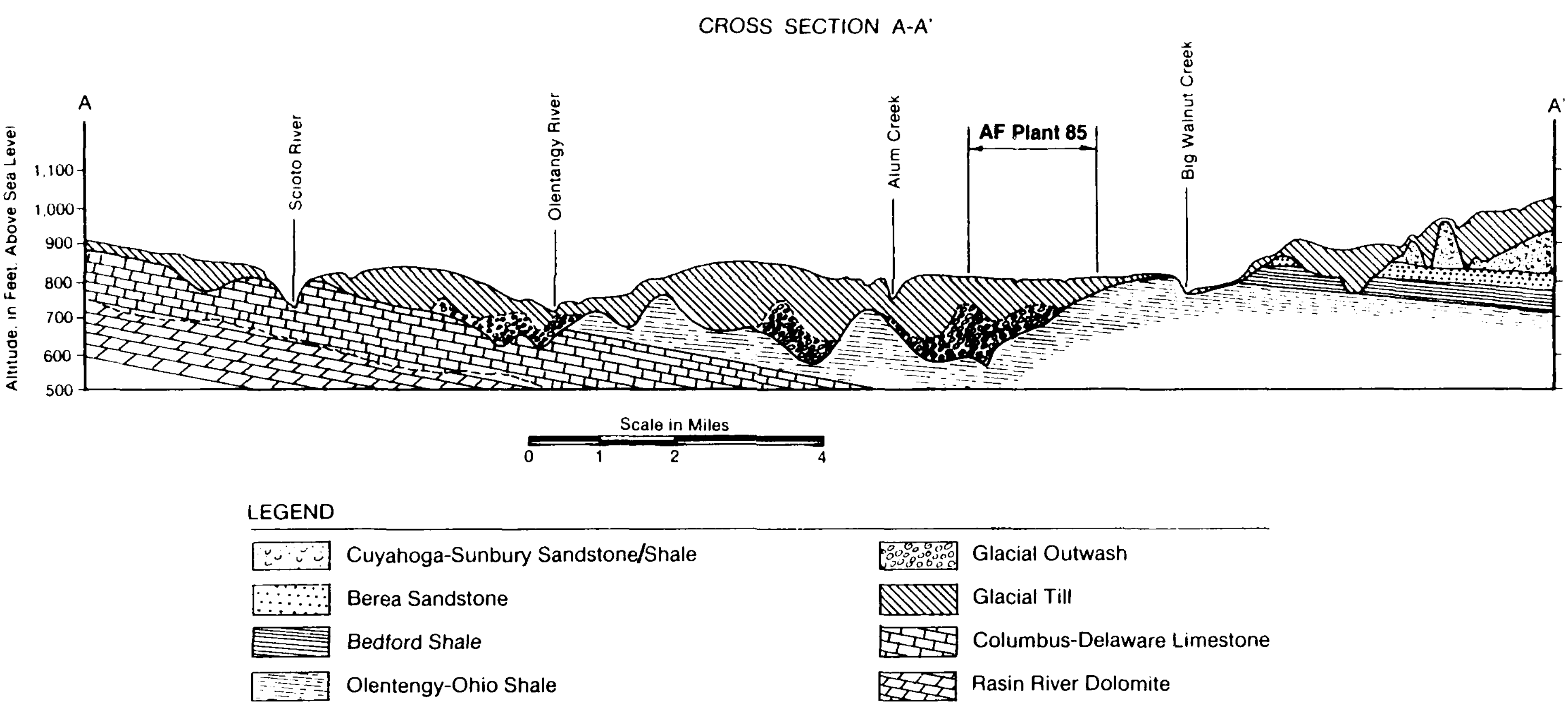

Note: See Figure 5 for location of cross section.

Source: Bulletin 30, Ohio DNR.

FIGURE 7.
Generalized Geologic Cross Section of AF Plant 85, Franklin County, Ohio.

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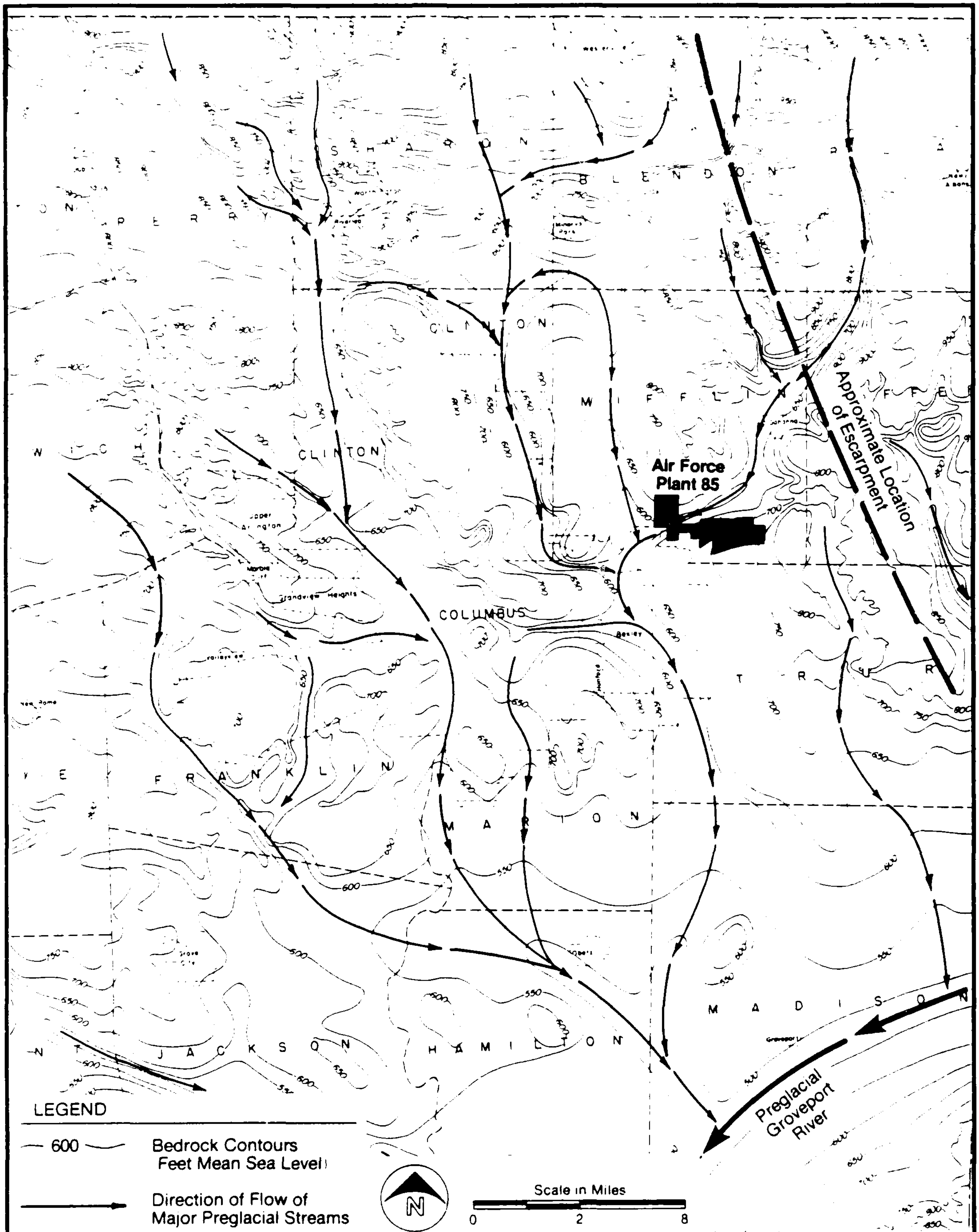
the Sunbury shale, and the Cuyahoga sandstone. These formations are located east of Big Walnut Creek and are therefore not present at AF Plant 85. The Mississippian System is not of significant concern to this study.

The surface of the consolidated bedrock is overlain by unconsolidated Pleistocene (glacial) deposits. If the unconsolidated deposits were removed, the topography of the consolidated bedrock surface would reveal considerable variation in bedrock relief, as shown in Figure 8.

The bedrock surface in the central and western parts of the county is distinguished by a low plateau having a grandly rolling surface typical of an old-age stage of erosional development. The bedrock divides are low and rounded with gentle slopes between the lowlands and the divides. A prominent buried bedrock escarpment is present in the eastern part of the county near AF Plant 85. This escarpment trends north-south; the bedrock surface west of the escarpment reaches a height of approximately 700 to 800 feet msl, whereas, east of the escarpment, the bedrock surface reaches an approximate height of 950 to 1,000 feet msl.

Buried stream channels indicate the preglacial drainage system. The main buried channel, known as the preglacial Groveport River, is located in southeastern Franklin County about 9 miles south of AF Plant 85. A major tributary to the preglacial Groveport River flowed beneath the present-day plant from the area of Gahanna to Bexley and thence southward to its confluence with the preglacial Groveport River along the general course of present-day Alum Creek. This buried valley is at a depth of approximately



Source: Bulletin 30, Ohio DNR.

FIGURE 8.
Bedrock Topography, AF Plant 85, Franklin County, Ohio.

200 feet below the present ground surface in the area of AF Plant 85. Glacial outwash deposits which fill the buried valley provide a major channel for the possible migration of contaminants in the ground water, as discussed later in this section.

3. Surficial Geology

The area that is now Franklin County was glaciated during at least two different glacial periods: the Illinoian and the Wisconsin. Some of the deeply buried bedrock valleys are partially filled with fine, well-sorted sands which probably accumulated in Illinoian time in relatively quiet waters. The Wisconsin glacier covered the Illinoian deposits in two stages. The first stage occurred about 50,000 years ago and left a layer of relatively impermeable glacial till when it receded. A sand and gravel deposit between 5 and 100 feet thick is present on top of the till and is exposed in many places in Franklin County, particularly south of Columbus. The deposit is layered and cross-bedded, indicating that the sands and gravels were deposited as glacial outwash in swiftly-moving waters as the glacier melted.

The second Wisconsin glacial stage occurred about 22,000 years ago and left a second layer of till on top of the outwash deposits and bedrock. This till forms the primary surface deposit in the county, averaging 50 feet in thickness. In the northeastern part of the county in which AF Plant 85 is located, the till consists of a medium-lime clay loam that contains a high percentage of sandstone and coarse shale fragments from the underlying bedrock.

A review of soil borings and well logs in the vicinity of AF Plant 85 indicates that the subsurface conditions in the eastern portion of the plant site consist of

less than 15 feet of clayey till over shale bedrock. The bedrock surface drops sharply to the west; along the western portion of the site, the subsurface conditions consist of approximately 50 feet of clayey till over sand and gravel outwash deposits. Shale bedrock in this area is present at a depth of approximately 200 feet.

4. Soils

Soils present at AF Plant 85 belong to the Bennington-Pewamo Association. These soils are formed in fine-textured glacial till on relatively flat upland surfaces. The Bennington Series soils consist of yellowish-brown silty clay loams which percolate slowly and are generally wet, easily eroded soils. The Pewamo Series soils consist of gray clay loams which are generally wet to ponded, easily eroded soils which also percolate slowly. The distribution of these soils at AF Plant 85 is shown in Figure 9.

All soils at the plant are urban land complexes with slopes ranging from 0 to 6 percent. Table 4 lists the soil series at AF Plant 85 and the characteristic engineering properties of each soil type. The soils are somewhat poorly drained; permeabilities of the soils range from 4×10^{-5} to 4×10^{-4} cm/sec.

C. HYDROLOGY

1. Surface Water Hydrology

AF Plant 85 is located within the drainage basin of Big Walnut Creek, a tributary of the Scioto River. The general direction of surface-water drainage at AF Plant 85 is shown in Figure 10. Surface-water runoff from

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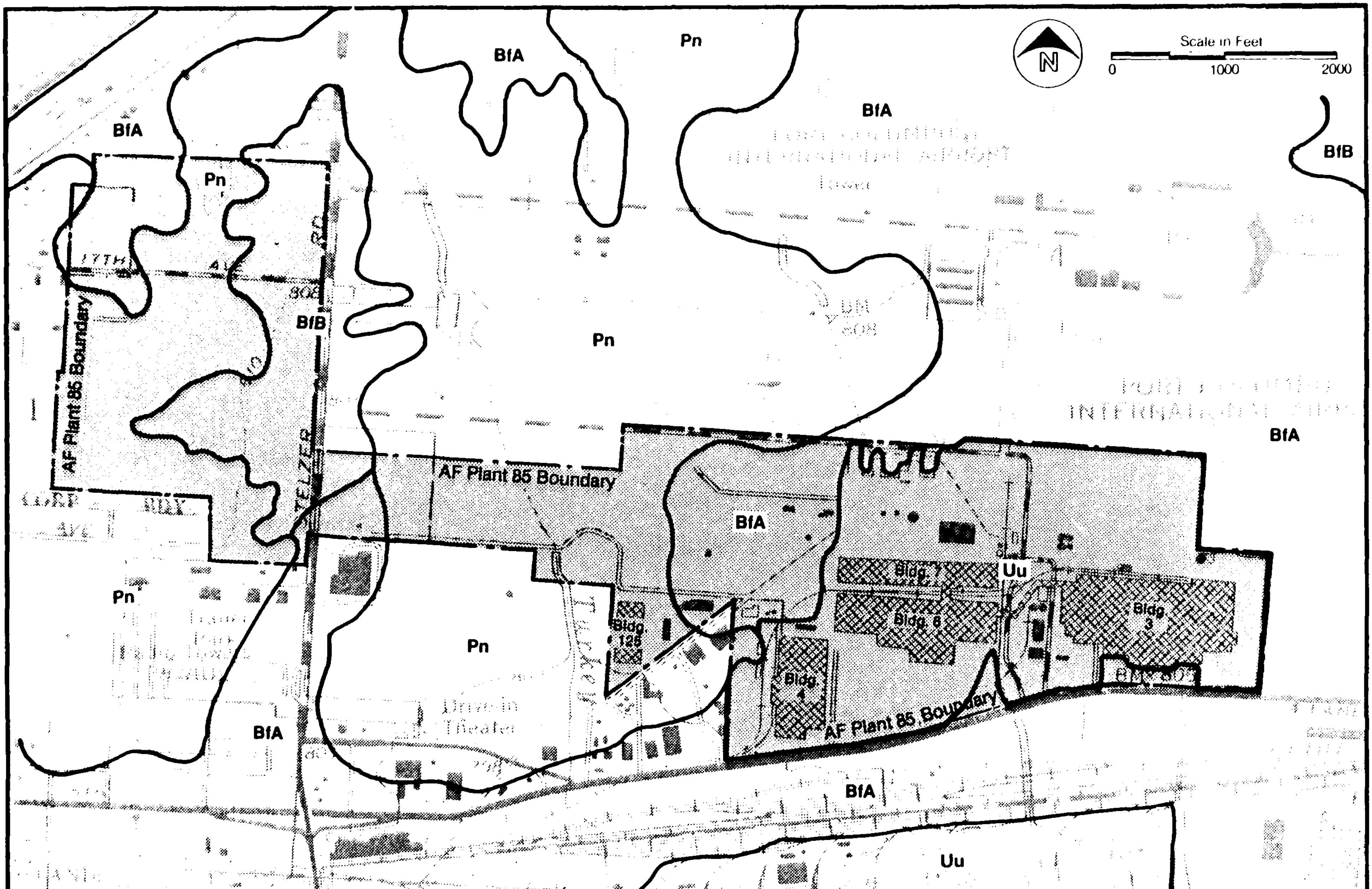

Note. See Table—for description of soil types.

FIGURE 9.
Soils Map of AF Plant 85.

Table 4
SOIL TYPES AT AF PLANT 85[a]

Soil Name	Map Symbol	Characteristic Permeability (cm/sec)	SCS Hydrologic Group	Typical Percent Passing No. 200 Sieve	Typical Liquid Limit	Typical Unified Soil Classification
Bennington--Urban Land Complex	B_fA, B_fB	$4x10^{-5}$ to $1x10^{-4}$	C	70-100	30-50	CL
Pewamo--Urban Land Complex	P_n	$1x10^{-4}$ to $4x10^{-4}$	B/D	75-95	35-55	CL, CH
Urban Land--Bennington Complex	U_u	$4x10^{-5}$ to $4x10^{-4}$	C	70-100	30-50	CL

[a]Source: U.S.D.A. Soil Conservation Service.

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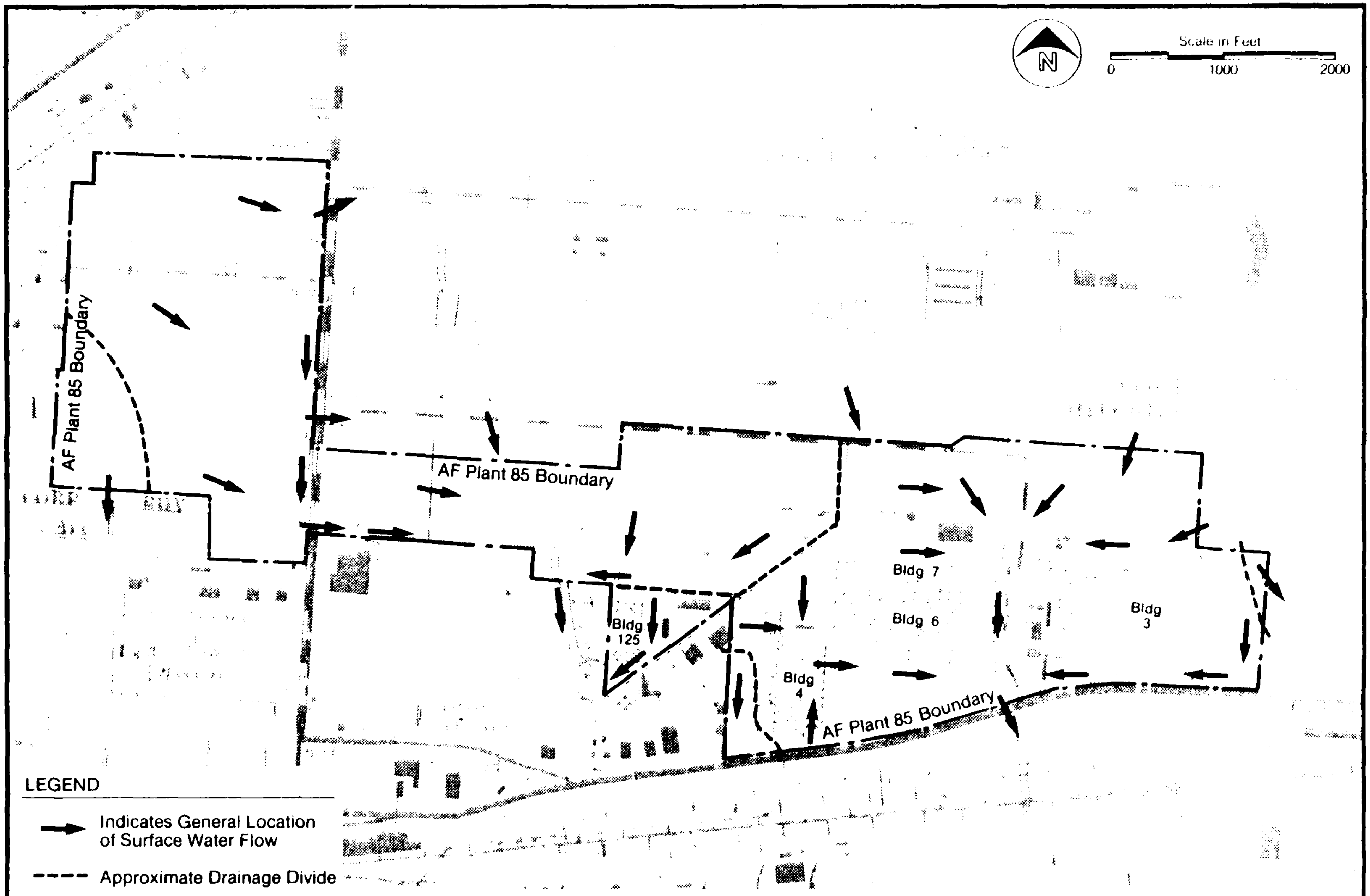

FIGURE 10.
Surface Drainage Map of AF Plant 85.

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the plant discharges into two creeks: Turkey Run, located in the western portion of the site, and Mason's Run, located in the central plant area. Both streams enter the plant site from the Port of Columbus to the north and flow south, eventually joining Big Walnut Creek about 5 miles south of the site. Flow within these creeks is generally low except during times of precipitation. Due to the large proportion of paved area and relatively impermeable surface soils, surface runoff is highly dependent on recent storm events.

An extensive stormwater drainage system has been constructed throughout the main plant area which discharges to Mason's Run at the plant entrance gate. Miscellaneous fuel spills and oily discharges to Mason's Run have been reported in the past which resulted in the construction of an oil skimmer system in the creek near the entrance gate. Water quality within Mason's Run is discussed in more detail in Section IV.

No other surface water features are present at the plant site. No wetlands or swampy areas are located at or near the plant. Flooding is limited to the localized creek beds.

Surface waters are the primary source of municipal water supplies in Franklin County. The nearest surface-water reservoir to AF Plant 85 is located on Big Walnut Creek, about 8 miles upstream of the plant site to the north. There are no known surface-water supplies within 3 miles downstream of the plant.

The potential for offsite migration of contaminants from any surface spill or disposal area via surface waters would be relatively high at AF Plant 85 due

to the low permeability of the site soils, the extensive paved area, the resulting high stormwater runoff, and proximity to surface drainages.

2. Ground-Water Hydrology

Ground water in Franklin County is present in three general aquifer systems: Devonian limestone aquifers, Mississippian sandstone aquifers, and glacial outwash aquifers.

The lower Devonian rocks, principally the Rasin River and Columbus limestones, are major sources of ground-water supply in western Franklin County, supplying about one-third of all ground water used within the county. Ground water is present in fractures, joints, and crevices within the limestone; well yields are therefore dependent on the solubility and extent of solution formation within the limestone. Yields of 175 gallons per minute (gpm) have been obtained in the Columbus Formation and as much as 400 gpm have been obtained in the combined Columbus-Rasin River limestone aquifer. Ground water within the Devonian limestones is generally high in specific conductance, iron, sulfate, dissolved solids, and hardness, and often high in hydrogen sulfide, as shown in Table 5.

The Devonian and Mississippian shales are relatively impermeable deposits which are seldom used as sources of water except in limited weathered zones. The shales serve as an effective confining layer separating the artesian limestone aquifers and the more permeable overlying deposits.

East of Big Walnut Creek, Mississippian-age sandstones, primarily the Berea and lower Cuyahoga sandstones are relatively permeable deposits which may yield between 25

Table 5
CHARACTERISTIC ANALYSES OF GROUND WATER IN THE VICINITY OF
AF PLANT 85, FRANKLIN COUNTY, OHIO

Aquifer Source	pH	Specific Conductance (μmhos)	Iron (ppm)	Calcium (ppm)	Magnesium (ppm)	Bicarbonate (ppm)	Sulfate (ppm)	Hydrogen Sulfide	Chloride	Dissolved Solids	Hardness as $CaCO_3$	
											Total	Noncarbonate
Glacial Outwash Deposits	7.3	726	1.8	99	31	380	81	--	7.0	456	387	75
Cuyahoga Formation	7.3	728	0.6	90	38	416	71	--	3.4	438	380	64
Berea Sandstone	6.8	756	1.2	82	35	316	122	Slight	14.3	478	349	104
Bedford-Ohio Shales	7.3	1,653	0.4	136	61	531	472	--	40	1,177	590	286
Columbus Limestone	7.3	1,580	1.6	227	80	399	600	4.0	39	1,249	902	577
Columbus-Rasin River Limestones	7.3	1,859	0.7	291	98	346	838	17.0	47	1,555	1,129	855

Source: Bulletin 30, Ohio DNR.

and 70 gpm of ground water. The deposits are not major sources of ground water, however, because the thickness varies widely and because the deposits are limited in horizontal extent.

Permeable glacial outwash deposits in buried bedrock valleys associated with the Scioto, Olentangy, and Big Walnut streams are the major ground-water aquifers in Franklin County. Wells drilled into these aquifers have a potential yield of 1,000 to 1,500 gpm when connected hydraulically with the streams. Glacial outwash deposits are present beneath a portion of Alum Creek less than one mile west of AF Plant 85. Small, isolated sand and gravel outwash deposits are also present in pockets along Big Walnut Creek, less than one mile east of the site.

Yields of as much as 200 gpm may be obtained from the sand and gravel outwash deposits which underlie thick till in the buried bedrock valleys. The southwestern portion of AF Plant 85 is underlain by this type of aquifer system. The thick till reduces the amount of rainfall infiltration and local recharge, resulting in lower well yields than for sand and gravel deposits in direct contact with surface streams.

Most of the remaining portion of the plant site is underlain by lenses of sand and gravel interbedded in clayey till which overlies the shale bedrock. Yields of as much as 25 gpm are typically obtained north of 17th Street where the deposits can reach 200 feet in thickness within a buried bedrock valley. In the area of Mason's Run, yields from irregular and thinly scattered sand and gravel lenses are only 5 to 10 gpm. The eastern portion of the site between Mason's Run and Big Walnut Creek is underlain by thin glacial till over relatively impervious shale; well yields are typically less than 2 gpm in this area.

Water quality within the glacial aquifers is generally good, although the water is typically high in hardness and is usually treated for the removal of iron.

The principal ground-water aquifer at AF Plant 85 is in the glacial deposits overlying the impermeable shales. For the most part, recharge to this aquifer occurs through infiltration from creeks during the spring, including Mason's Run, Turkey Run, Alum Creek, and Big Walnut Creek. Minor recharge also occurs as direct infiltration of precipitation through the glacial deposits. Ground water discharges chiefly to major streams during the fall. Hence, the water table usually declines persistently throughout the summer, reaching its lowest stage in the fall and its highest stage in the early spring.

The shape of the ground-water table is controlled by both surface and bedrock topography. The ground-water table generally follows the slope of the overlying topography, being higher in the uplands than in the valleys. Ground-water flow is therefore generally towards major streams. During periods of heavy precipitation or flooding, however, ground-water flow may be reversed, raising the ground-water table adjacent to streams. The relatively impermeable shale bedrock also affects the direction of ground-water flow as a result of the bedrock divides and buried valleys.

The direction of ground-water flow throughout most of AF Plant 85 is most likely to the west and southwest, following the contours of the underlying bedrock, to discharge into Alum Creek. The approximate depth of the ground-water table varies from approximately 10 feet in the eastern portion of the plant site to approximately 50 feet in the western portion of the plant site. The ground-water gradient is therefore about 20 feet per mile.

Perched ground water is present within the clayey glacial till deposits above the regional ground-water table. This perched ground water is of limited thickness and extent, but results in saturated soil conditions near the ground surface in many areas. The perched ground water is recharged by infiltration of precipitation and discharges locally to streams such as Turkey Run and Mason's Run, or vertically to the underlying ground-water table.

Numerous potable water supply wells have been drilled in the vicinity of AF Plant 85, some of which are shown in Figure 11. These wells have been developed in the glacial outwash deposits and do not penetrate through the underlying relatively impermeable shale. A total of approximately 1,000 wells may be located within a 3-mile radius of the plant; however, most of these wells have been abandoned. No active or abandoned wells which could be used for water sampling or as a future water supply are known to exist on AF Plant 85. Abandoned wells with improperly sealed casings or wells which have been improperly abandoned are potential direct pathways to the water table. The City of Columbus operates a municipal water supply system serving the entire area including the towns of Bexley, Whitehall, and Gahanna. The City of Columbus does not require residences to use the municipal supply and maintains no record of which residences have not hooked up. Between 50 and 100 private wells may still be in service within a 3-mile radius of AF Plant 85.

The former Nelson Road Municipal Well Field and Water Treatment Plant was located near Alum Creek about one mile west of AF Plant 85. The City of Columbus stopped using the Nelson Road plant in the early 1970s because of declining water quality. At the time of the Nelson Road

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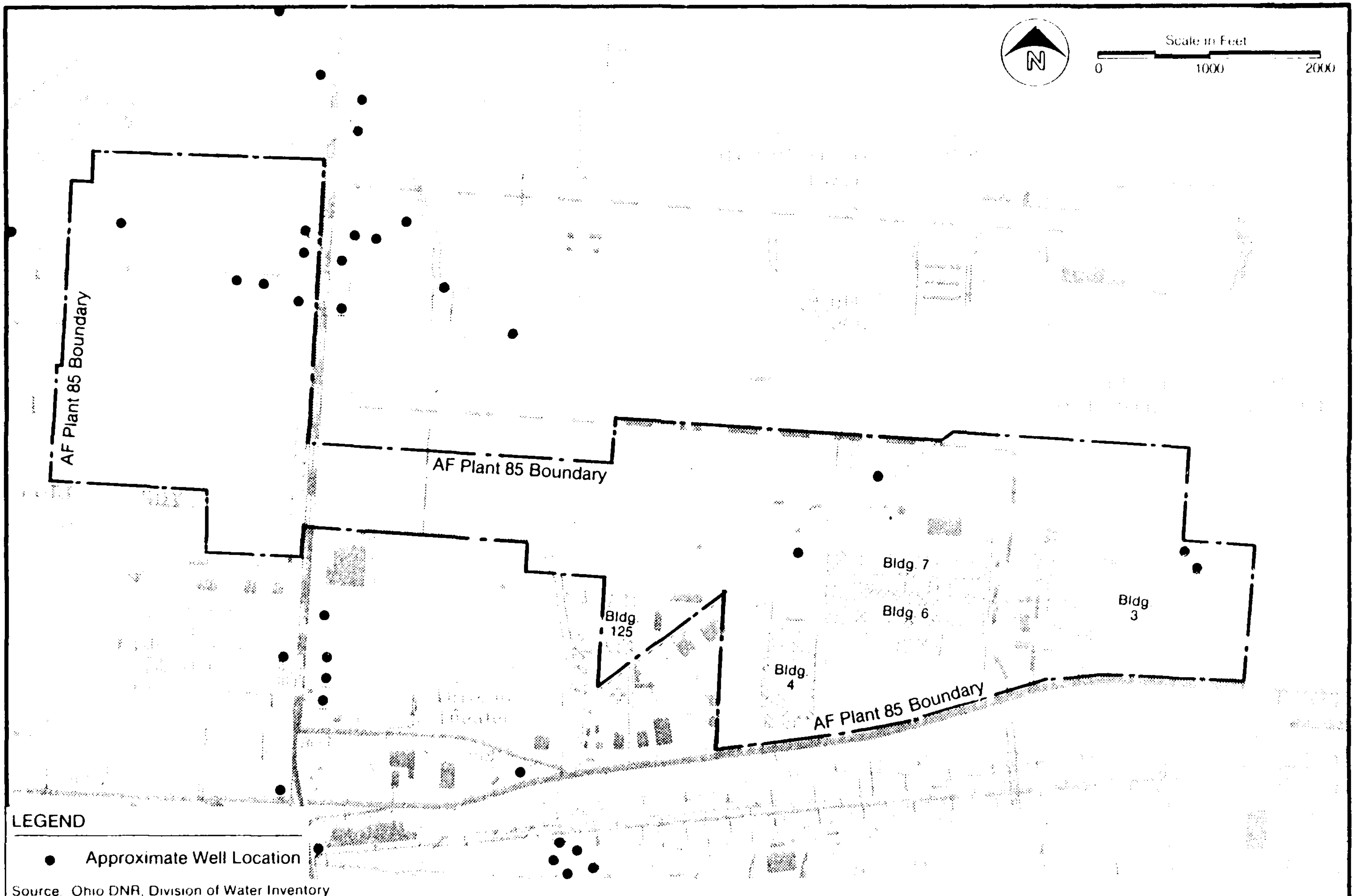

FIGURE 11.
Location Map of Abandoned Water Wells at AF Plant 85.

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plant shut-down, the water had a hardness of 500 to 1,000 ppm. The four municipal wells have not been abandoned and may potentially be used as an alternative supply of water in the future.

Currently, the City of Columbus obtains most of its water supplies from surface-water sources. The existing municipal well field, used to supplement surface-water supplies, is located in south Columbus more than 10 miles from AF Plant 85, and is developed in the glacial outwash deposits near the confluence of the Scioto River and Big Walnut Creek.

The potential for ground-water contamination from any past waste disposal practice at AF Plant 85 is moderately low due to the presence of clayey till of moderate permeability as much as 50 feet thick, and a ground-water table up to 50 feet deep. Contaminants would probably migrate horizontally in shallow perched ground water and would discharge into Turkey Run or Mason's Run. Contaminants could also migrate slowly downward through the till to the underlying sand and gravel, then flow west-southwest and discharge into Alum Creek. A low-permeability shale which underlies the entire site would effectively limit any further vertical ground-water movement.

D. ECOLOGY

The flora and fauna of AF Plant 85 are typical of what might occur in any urban industrialized site in the Columbus area. The main plant area is almost entirely covered with buildings, parking lots, and paved areas. The former radar test range west of the main plant area is covered with field grass which is maintained by regular mowing. The remaining

174 acres west of Stelzer Road is covered with miscellaneous young tree and brush growth, including sycamore and common shade trees. A strip of field grass about 50 feet wide is maintained around the perimeter fence and approximately 13 acres are maintained adjacent to the FAA Instrument Landing System. In addition, because the area is located at the end of the runway for the Port of Columbus airport, the vegetation is cleared approximately every 10 or 15 years.

The vicinity of AF Plant 85 is primarily urban; industrial, commercial, and residential zoning areas surround the plant. The Ohio Division of Natural Areas and Preserves reviewed available regional information concerning the location of major habitats of any threatened or endangered species or other significant natural areas within 3 miles of the plant. The following four areas were identified in that review:

1. A one-mile stretch of Big Walnut Creek located south of Morse Road, approximately one mile north of Gahanna, is the habitat of *Hiodon tergisus* (Mooneye), a state endangered fish.

2. A 2,000-foot stretch of Big Walnut Creek in Gahanna, approximately one mile northeast of AF Plant 85, is the habitat of *Etheostoma maculatum* (Spotted Darter), a state endangered fish.

3. The Gahanna Woods Natural Preserve, approximately 3 miles northeast of AF Plant 85, is owned by the Ohio Department of Natural Resources and managed by the City of Gahanna Parks. The preserve comprises over 50 acres and offers visitors enjoyment of four different habitats. Small woodland ponds and a buttonbush swamp occupy the

low-lying areas. A pin oak-silver maple swamp forest rings these areas, followed by oak-hickory and beech-maple associations on the higher and drier sites. Woodland wild flowers include the yellow water crowfoot, Canada lily, swamp saxifrage, wild hyacinth, skunk cabbage, and trillium. The preserve also includes an old field community of goldenrods, sunflowers, and asters.

4. A smaller 6-acre area of land immediately south of Gahanna Woods is the habitat for the Hemidactylium scutatum (four-toed salamander), a state endangered salamander.

IV. FINDINGS

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A. ACTIVITY REVIEW

1. Summary of Industrial Waste Disposal Practices

Many of the industrial operations that generate waste materials have been located in Building 3 since the plant operations began in 1941. From the beginning, AF Plant 85 has been predominantly involved with the final assembly, and flight acceptance and testing of newly constructed aircraft. The major industrial operations include machining and forming, metal finishing and electroplating, painting and coating, small parts assembly, and aircraft and missile subassembly.

The total quantities of paint sludges, waste oil, spent solvents, spent dip tank solutions, stripper and cleaners generated currently at the plant range from 220,000 to 230,000 gallons annually. Of this total quantity, approximately 90,000 gallons consist of milling coolant oil and 73,000 gallons of paint sludges. Both the coolant oil and paint sludges were recently analyzed for the four hazardous waste characteristics (EP toxicity, corrosivity, reactivity, and ignitibility) and found to be non-hazardous. The current rate of waste quantity generation is less than that of previous years when plant operations were larger. The types of wastes currently being produced are also different. The primary reasons for the different types and quantities of waste generation are provided below.

- Peak levels of production activity at AF Plant 85 occurred during World War II (1941-1945) and from the start of the Korean conflict (1951) through the year 1967. During these

periods, waste production of solvent, contaminated fuels, and oils has been estimated at 30,000 to 40,000 gallons per year more than the current rate of waste production.

- Flightline operations were ended at the plant in 1981. Several laboratories associated with the testing of flightline aircraft (fuels lab, thermo lab, structures lab) were inactivated. In addition, the use (and, consequently, waste production) of jet fuels and engine oils was stopped at the facility.

The current level of waste quantity generation is anticipated by plant personnel to remain relatively constant or possibly increase slightly over the next several years.

Past and present industrial waste disposal practices for AF Plant 85 are summarized below:

- 1941-1950. Most of the waste oils, solvents, and aviation fuels were collected and burned at the fire department training area (Site No. 3). Waste oil drums were collected from the various accumulation points by fire department personnel and transported to the training area. During this time, a 500-gallon bowser was used to collect the waste fuels for transport to the training area.

  Paint strippers were applied to aircraft on a concrete pad located outside and to the north of Building No. 3. The stripping materials

and paint chips were washed off the aircraft and discharged to the stormwater drainage system leading to Mason's Run.

- 1951-1965. Waste engine oils and fuels were still somewhat used in fire department training exercises during this time period. The majority of the waste oils were, however, collected in bowsers and sold to an outside contractor for offsite disposal. Former flightline personnel indicated that relatively small amounts of waste fuel were generated, since most of the aviation fuel drained from the aircraft tanks was reused. During the early 1950s, several of the metal cleaning, etching, and electroplating tanks were installed in Building No. 3. Concentrated acid solutions from these tanks were collected and transported to a neutralization tank which was located near the present wastewater treatment plant (WWTP). The solutions were batch-neutralized and then discharged to the sanitary sewer for further treatment by the City of Columbus. Overflow from the process rinsewater tanks were also discharged to the sanitary sewer. Sludges from these process tanks were drummed and removed offsite by an outside contractor.

- 1965-present. Waste oils and fuels are removed from the plant by an outside contractor. Portions of the waste fuels and oils from the flightline operations were burned in fire department training exercises until 1977 when the training area was

abandoned at the plant. With the cessation of flightline operations in 1981, waste aviation fuel is no longer being generated. In 1965, the WWTP was constructed at AF Plant 85 to neutralize all industrial process wastewaters prior to discharge to the sanitary sewer for further treatment by the City of Columbus. The majority of the AF Plant 85's industrial wastewater flow comes from the rinsewater overflow tanks of the various metals cleaning, etching, and electroplating processes. Metal processing tanks containing chromium solutions are transported to the WWTP in 500-gallon tank carts. Hexavalent chromium solutions are reduced to the trivalent state with sulfur dioxide. The reduced chromium solutions are then discharged to the sanitary sewer.

Cyanide wastes generated in the electroplating process are transported to a cyanide storage tank located at the WWTP and subsequently hauled offsite by an outside contractor for disposal.

Sludges collected during cleanout of the various electroplating dip tanks are drummed and transported offsite by an outside contractor for disposal.

Lime sludges generated at the WWTP are dewatered, collected in runoff bulk containers, and hauled offsite by an outside contractor for disposal. Approximately 340 wet tons of the lime sludge are generated annually.

Degreasing operations, which use 1,1,1-trichloroethane (TCA) as the solvent, are located in Building No. 3. Spent TCA degreasing solutions are collected in 55-gallon drums and stored at the James Road Hazardous Waste Storage Pad (Site No. 8). Spent solvent drums are sold to offsite recycling contractors. Other waste solvents (acetone, MEK) are also stored in drums at the James Road Hazardous Waste Storage Pad and transported offsite by contract haulers.

Trichlorethylene (TCE) was formerly used as a degreasing solvent in place of TCA. The TCE was previously stored in two underground tanks (146 and 147) located near the Oil House; waste TCE was either used in fire department training exercises or hauled offsite by an outside contractor for disposal.

Methylene chloride/phenolic paint strippers used in the Building 13 stripping shop are collected in drip pans and then poured into 55-gallon drums. These drums are also transported offsite by an outside contractor for disposal.

2. Industrial Operations

The industrial operations at AF Plant 85 have been primarily involved in the final assembly, flight acceptance testing, maintenance and modification of jet aircraft.

The majority of the plant's waste materials are generated by the 804 Paint and Processing Department. This Department is responsible for chemically preparing and painting metal parts.

Table 6 summarizes the major industrial operations at the plant and includes the estimated quantities of wastes generated as well as providing the past and present disposal practices. Information on estimated waste quantities and disposal practices were obtained from interviews with shop and laboratory personnel. Plant records of chemical usage and disposal rates were also reviewed.

Descriptions of the major industrial activities currently being conducted at the plant are provided below.

a. Department 804--Paint and Processing

1. Detail Paint Shop

The Detail Paint Shop is located on the north side of Building No. 3. A total of three down-draft and one waterwall booths are operated in the area to remove paint particles from the air. The paint sludges and water from these booths are removed as required. These materials have been tested by the plant and determined to be non-hazardous based on the results of EP toxicity tests conducted on the paint sludge-water mixture. The sludges are transported off-base by an outside contractor for disposal. Approximately 73,000 gallons of paint sludges are removed annually from the water booths. The detail paint shop also uses rags soaked in MEK to prepare metal surfaces prior to painting. The solvent evaporates from the rags prior to their disposal or recycle.

Table 6
MAJOR INDUSTRIAL OPERATIONS SUMMARY

Shop Name/Department	Present Location (Bldg. No.)	Waste Material	Current Estimated Waste Quantity (gal/yr)	Past and Present Waste Management (1940–1980)
Detail Paint Shop (804)	3	Paint Sludge	73,000[a]	Sanitary Sewer; Contractor Removal
Metals Clean (804)	3	Alkaline Cleaner	5,230	Treated at WWTP[b]
		Nitric Acid and Ammonium Bilsulfide	2,520	Treated at WWTP[b]
		Chromic Acid	6,600	Contractor Removal; Treated at WWTP[b]
		Nitric Acid	3,360	Treated at WWTP[b]
Aluminum Processing (804)	3	Sodium Dichromate	12,000	Contractor Removal; Treated at WWTP[b]
		Cyanide/Nitric Acid/ Chromic Salt	6,200	Contractor Removal
		Acid Etch	8,800	Treated at WWTP[b]
		Alkaline Etch	14,000	Treated at WWTP[b]

[a]Waste has been shown to be non-hazardous based on the results of EP toxicity tests.

[b]Treated effluents from plant are discharged to the sanitary sewer. Prior to 1965, wastes were batch-neutralized prior to discharge to the sanitary sewer.

LEGEND

- - - - Assumed period of operation.
______ Known period of operation.

Table 6--Continued

Shop Name/Department	Present Location (Bldg. No.)	Waste Material	Current Estimated Waste Quantity (gal/yr)	Past and Present Waste Management 1940 1950 1960 1970 1980
Vapor Degreasing (804)	3	1,1,1-Trichloroethane	750	Contractor Removal
Electroplating (804)	3	Acid Pickle Solution	540	Treated at WWTP[b]
		Chromium Plating Solution	670	Contractor Removal; Treated at WWTP[b]
		Chromic Acid Reversing Solution	325	Contractor Removal; Treated at WWTP[b]
		Chromic Acid and Sodium Cyanide	2,100	Contractor Removal
Resistance Welding (826)	3	Alkaline Cleaner	200	Treated at WWTP[b]
		Cyanide and Chromium Salt Solution	200	Contractor Removal
Honeycomb Bonding (826)	3	Alkaline Cleaner	960	Treated at WWTP[b]
		Alkaline Etch	960	Treated at WWTP[b]

[a]Waste has been shown to be non-hazardous based on the results of EP toxicity tests.

[b]Treated effluents from plant are discharged to the sanitary sewer. Prior to 1965, wastes were batch-neutralized prior to discharge to the sanitary sewer.

LEGEND

- - - - Assumed period of operation.
______ Known period of operation.

Table 6--Continued

Shop Name/Department	Present Location (Bldg. No.)	Waste Material	Current Estimated Waste Quantity (gal/yr)	Past and Present Waste Management (1940 1950 1960 1970 1980)
		Dichromate and Sulfuric Acid Etch	1,600	Contractor Removal; Treated at WWTP[b]
Foundry and Plastics Manufacturing (803)	3	Acetone	1,600	Contractor Removal
Chip Baler Storage (859)	125	Coolant Oils	24,000[a]	Contractor Removal
Stripping Shop (804)	13	Methylene Chloride/ Phenolic Strippers	2,860	Stormwater Drainage System; Drummed and Removed Offiste
WWTP	WWTP	Dewatered Lime Sludge	340[c]	Contractor Removal
All Machine Milling Shops	General Plant	Milling Coolant Oils[a]	66,000	Contractor Removal

[a]Waste has been shown to be non-hazardous based on the results of EP toxicity tests.

[b]Treated effluents from plant are discharged to the sanitary sewer. Prior to 1965, wastes were batch-neutralized prior to discharge to the sanitary sewer.

[c]Wet tons per year.

\- - - - Assumed period of operation.
______ Known period of operation.

2. Metals Clean Shop

The metals clean shop is also located on the north side of Building No. 3. The shop consists of various dip tanks which clean, decontaminate, and descale aluminum, titanium, and steel alloys.

The shop uses a total of 20 tanks for cleaning metal parts. Rinsewater from dip tanks contained in the shop continuously overflows to an industrial sewer system leading to the WWTP where it is neutralized prior to discharge to the sanitary sewer. Spent cleaning and descaling solutions are transported in bulk to the WWTP for treatment. The metals clean shop annually generates an estimated 5,230 gallons of spent alkaline cleaner, 2,520 gallons of waste nitric acid plus ammonium bifluoride solution, 6,600 gallons of chromic acid solution, and 3,360 gallons of dilute nitric acid.

3. Aluminum Processing

The aluminum processing shop consists of chemical dip tanks that anodize aluminum and aluminum alloys. Titanium metal parts are also chemically treated in this area. This shop is located west of the metals clean area in Building No. 3. Three separate processing lines are included in this area:

- Aluminum anodizing
- Titanium alodine treatment
- Aluminum alodine treatment

The area contains a total of 16 chemical dip tanks. The washwater from the dip tanks continuously overflows to the industrial sewer lines leading to the WWTP

where it is treated prior to discharge to the sanitary sewer. Spent chemical solutions from the dip tanks are transported in bulk to the WWTP for treatment. Estimated annual waste generation of these spent solutions includes 12,000 gallons of sodium dichromate solution and 6,200 gallons of a cyanide plus nitric acid plus chromic salt mixture.

4. Chemical Mill

The Chemical Mill area, located in Building No. 3, uses both the caustic and acid methods to chemically mill aluminum alloy metal parts. The area contains a total of 10 dip tanks. Timers are installed in the rinsewater tanks to control the spray rinsewater overflow rate. The overflow from the rinse tanks is discharged to the industrial sewer system leading to the WWTP where it is treated prior to discharge to the sanitary sewer. Estimated annual waste generation of spent process solutions includes 8,800 gallons of acid etch and 14,000 gallons of alkaline etch.

5. Vapor Degreasing

The main vapor degreasing tank is located west of the aluminum processing area on the north side of Building 3. Metal parts for degreasing are placed into a wire basket which is then lowered into the tank. Vapors of the solvent 1,1,1-trichloroethane are used to clean the metal parts. Spent solvent is removed from the tank, drummed, and hauled by an outside contractor for disposal offsite. An estimated 750 gallons of waste solvent are generated annually.

6. Electroplating

This shop, also located in Building 3, uses electrochemical processes to plate chromium and cadmium onto carbon and low alloy steels. The area contains a total of 22 process and rinsewater tanks. The rinsewater overflow is discharged to the WWTP. The shop annually generates approximately 540 gallons of waste acid pickle solution, 670 gallons of chromium plating solution, 325 gallons of chromic acid solution, and 2,100 gallons of a chromic acid and sodium cyanide mixture. Waste solutions are removed from the tanks and hauled offsite by an outside contractor for disposal.

7. Stripping Shop

Paint stripping is performed in Building 13. Methylene chloride and phenolic stripper is applied to the painted surfaces. Paint stripping area personnel estimated that approximately one 55-gallon drum of stripping sludge is generated per week which amounts to an annual waste generation rate of 2,860 gallons. The stripping sludge is collected in drip pans, transferred to 55-gallon drums and hauled offsite by an outside contractor for disposal.

b. Department 826--Plastic and Honeycomb

1. Resistance Welding

Several process tanks are contained in the resistance welding area which are used to clean metal parts and prepare them for the resistance welding. The shop annually generates approximately 200 gallons of spent alkaline cleaner and 200 gallons of a cyanide and chromium

salt solution. The cyanide wastes are transported to the cyanide storage tank for subsequent offsite removal by an outside contractor. The chromium wastes are treated at the WWTP. The rinsewater overflow is discharged to the WWTP.

2. Honeycomb (Phenolic) Bonding

A total of seven process tanks are located in the honeycomb bonding area. These tanks are used for chemical cleaning and preparing aluminum parts for the phenolic or honeycomb bonding process. Rinsewater continuously overflows from the washwater dip tanks to the industrial sewer system leading to the WWTP where it is treated prior to discharge to the sanitary sewer. The area annually generates waste solutions which include 960 gallons of alkaline cleaner, 960 gallons of alkaline etch, and 1,600 gallons of sodium dichromate and sulfuric acid etch solution. The alkaline cleaner and etch solutions are collected in 55-gallon drums and transported offsite by an outside contractor. The sodium dichromate/sulfuric acid etch solution is transported to the WWTP for treatment.

c. Department 803

1. Foundry and Plastics Manufacturing

One of the functions of this department is the fabrication of plastic molds. The solvent acetone is used in this fabrication process. Approximately 1,600 gallons of waste acetone is generated annually from this area. The waste acetone is collected in 55-gallon drums and stored at the James Road hazardous waste storage pad until it is hauled offsite by an outside contractor.

d. Department 859

1. Chip Baler Area

Aluminum chips from machining operations are baled and stored in bulk on the south side of Building 125. Coolant oils removed from the aluminum chips are collected in a 10,000-gallon storage tank located near the building. Approximately 24,000 gallons of this non-hazardous oil is generated annually from the baler operation. An outside contractor periodically hauls the waste coolant oils offsite.

3. Fuels

No active aircraft fuel storage areas are located at AF Plant 85, because flightline operations are not currently active. Active storage areas for fuels other than aircraft fuel include the vicinities of the garage, the powerhouse, Building No. 3, and the surplus sales building. A 15,000-gallon MOGAS tank and a 15,000-gallon diesel oil tank are located near the garage, and four 15,000-gallon fuel oil tanks are located near the powerhouse. A 6,000-gallon waste engine oil tank is north of Building No. 3, and a 10,000-gallon waste coolant oil tank is in the vicinity of the surplus sales buildings (Building 125). Several other tanks at AF Plant 85 are used to store various fuels. A complete inventory of the major existing POL storage tanks is included in Appendix F.

During the 1950s and 1960s, when aircraft production was sizeable and aircraft were flight tested after production, refueling was accomplished by 5,000-gallon fuel trucks. Uncontaminated fuel was recycled into POL storage tanks formerly located near the old test cell building. Slightly contaminated fuel was either sold to an

outside contractor for offsite disposal, used in fire department training exercises, or sent to the powerhouse where it was mixed with diesel fuel. Contaminated fuel was removed by an outside contractor or used in fire department training exercises. To trap spills while refueling, a 1,500-gallon underground tank was installed near Compass Rose "G" in the 1960s, while the A-5 aircraft was in production.

No major fuel spills or ruptured fuel lines have been reported in the handling of fuels. No records were available to determine the maintenance schedule of tanks. Sludges generated from AVGAS tanks were transferred to waste oil tanks.

Many storage tanks have been abandoned or are scheduled for abandonment. Of these, major aircraft fuel tanks include four 2,000-gallon, one 10,000-gallon, and three 15,000-gallon tanks formerly used for JP-4 storage; and two 10,000-gallon and four 15,000-gallon tanks formerly used for JP-5 storage. Appendix F provides the status regarding abandonment of major existing POL storage tanks.

4. Fire Department Training Activities

Fire department training activities have been conducted at AF Plant 85 from the 1940s through 1977. Only one location on AF Plant 85 property has been used for these activities. The Fire Department Training Area (Site No. 4) was in use until 1977. Prior to 1953, training exercises were conducted in an oblong-shaped, natural depression. This area became excessively deep as a result of training exercises and was excavated and filled in 1953. A new, circular-shaped, earth-diked training area with a porous cinder base was built over the old area. In 1977, this

training area was deactivated, excavated, and backfilled with clean dirt to a depth of approximately 30 inches. No fire department training exercises have been conducted on AF Plant 85 property since 1977. A new training site which is located on the property of Port Columbus International Airport near the end of Runways 2-3 has been used by fire department personnel from AF Plant 85. However, only a few training exercises have been conducted at this site because aircraft production has remained low.

The training exercises were conducted at least monthly prior to 1970, after which their frequency slowly decreased to zero by 1977. As many as four fires were extinguished per training session, with a total of approximately 900 gallons of fuel consumed per session.

Fuels used in fire department training exercises consisted of waste magnesium chips, waste oils, and contaminated aircraft fuel. The waste magnesium chips were generated by the production line in the early 1970s. A 500-gallon bowser would transport waste oils and contaminated aircraft fuel from several collection points on the flightline to the fire department training area. Protein foam and water were predominantly used to extinguish fires prior to 1970. Since 1970, an agent referred to as "Aqueous Film-Forming Foam (AFFF)" has been used in fire department training exercises. AFFFs are non-corrosive, biodegradable, fluorocarbon surfactants with foamy stabilizers and pose a potential for environmental stress through oxygen depletion.

5. Polychlorinated Biphenyls (PCBs)

The main sources of PCBs at AF Plant 85 are electrical transformers. Other sources include hot form presses, capacitors, and switches. At present,

104 transformers, two hot form presses, and 47 large low voltage capacitors containing PCBs are in-service. No out-of-service transformers or PCB-containing waste materials are in storage at AF Plant 85 at present.

In the past, out-of-service transformers were sold to a contractor without draining transformer oil. Within the last decade, the disposal practice has been to drain oil from the transformer prior to disposition. The empty transformers are sold to a contractor. The drained oil is also sent to another contractor for incineration. Approximately five PCB-containing transformers are disposed of per year.

Except for one recent incident, no records or verbal reports exist of any major PCB spills from leaking or blown transformers or during the handling of any PCB materials. The recent PCB incident involved the spillage of several gallons of PCB-containing oil onto the ground near Building No. 143. Soil was excavated and hauled off site. Further discussion of this PCB spill is presented in Section IV.B.

6. Pesticides

Pest and weed control at AF Plant 85 has always been conducted by an offsite contractor. At present, the installation service contractor (Metro Exterminator) controls the use and handling of all pesticides used at AF Plant 85. Pesticides used include Ficam (25 gallons per year) and Diazinon (less than 10 pounds per year). Empty pesticide containers are removed by the contractor. No reports were found of banned or restricted pesticides or herbicides currently used on the installation or of any pesticide-related spills.

7. Wastewater Treatment

Sanitary wastewater from AF Plant 85 discharges to the City of Columbus sanitary sewer system and is conveyed offsite by a combination of gravity sewers and force mains. The sanitary wastewater discharges from AF Plant 85 are not currently monitored, although provisions are being made to begin flow measurement in the near future. Assuming that 75 percent of water entering AF Plant 85 is discharged to the sanitary sewer, current average daily sanitary wastewater flow is estimated at 1,200,000 gpd.

Industrial wastewater is treated by an onsite WWTP, which consists of two abovegrade 216,000-gallon holding tanks, several smaller abovegrade process tanks, a mix chamber, a belowgrade clarifier flocculator, a Parshall flume, and a chrome reduction facility. Treatment depends upon wastewater characteristics. Metal finishing rinses and washdowns are pumped from manufacturing process areas to the holding tanks and undergo neutralization either in these tanks or in the mix chamber. Neutralization is accomplished with lime, alkaline wastes, or waste acid. Acid and alkaline wastes are transported in a portable tank from the manufacturing area to the WWTP. The wastewater is then flocculated with lime, clarified, and sent to the sanitary sewer. Coal-pile leachate is collected in a sump adjacent to the pile and pumped to a WWTP process tank. This wastewater has an approximate pH of 2, and is lime-neutralized in the mix chamber, flocculated, clarified, and sent to the sanitary sewer. Hexavalent chrome wastes are transported in a portable tank from the manufacturing area to a WWTP process tank. The chrome washes are pumped from this tank to a chrome reduction facility which includes sulfur dioxide addition, neutralization, and dewatering of sludge with a rotary drum filter. Filtrate is discharged to the sanitary sewer, and the sludge is removed offsite by an

outside contractor. The rotary drum filter also dewaters the flocculator sludge. Cyanide wastes are transported in a portable tank from the manufacturing area to a WWTP process tank. These cyanide wastes are not treated, and are periodically removed offsite by an outside contractor.

Current average daily flow treated by the industrial WWTP is about 400,000 gpd. The WWTP was constructed in 1965 and has a design capacity of approximately 600,000 gpd. Prior to 1965, acid wastes were neutralized in an abovegrade steel tank located just north of Building No. 3 and then discharged to the sanitary sewer. Alkaline wastes were diluted and discharged to sanitary sewer inlets located in the manufacturing area. Chromium and cyanide wastes were put in small containers and disposed of offsite by an outside contractor.

8. Available Water Quality Data

Potable water for AF Plant 85 is obtained from the City of Columbus distribution system. Records indicate that several wells have been drilled on AF Plant 85 (see Section III). However, these wells have been abandoned and no ground-water quality records are available.

Sanitary wastewater is discharged to the City of Columbus sanitary sewerage system. No analyses are routinely performed, although an analytical program including flow and BOD measurement will soon be instituted. Effluent from the industrial WWTP is analyzed periodically for flow, pH, total metals, cyanide, lead, cadmium, chromium, copper, nickel, and zinc. Recent results indicate acceptable levels in the effluent.

The storm drainage system includes open storm ditches and underground concrete storm drains. Many of the storm drains discharge to Mason's Run and Turkey Run, which flow through AF Plant 85. The storm drainage system is not currently monitored for water quality. Mason's Run has been analyzed for pollutants in the past to comply with an issued National Pollutant Discharge Elimination System (NPDES) permit. An NPDES permit was granted from 1974 to 1977 because Mason's Run received boilerhouse blowdown water, which was eventually connected to the sanitary sewer. Another NPDES permit was issued from 1979 to 1980 because the coal pile leachate collection system had not been completed. Monthly grab samples were analyzed for suspended solids, oil and grease, COD, copper, iron, zinc, mercury, and pH. Water quality was generally acceptable, although copper was once found to exceed its permitted limit slightly. Several other pollutants were found in excess of allowable amounts, but the obtained data were inconsistent and discounted. Table 7 summarizes the water quality data obtained from Mason's Run between 1978 and 1979.

9. Other Activities

The review of the records and information obtained during the interviews produced no evidence of the past or present storage, disposal, or handling of biological or chemical warfare agents at AF Plant 85. No evidence of any past or present explosive ordnance disposal activities was found at AF Plant 85.

B. DISPOSAL AND SPILL SITES IDENTIFICATION AND EVALUATION

Interviews were conducted with installation personnel (Appendix C) to identify disposal and spill sites at AF Plant 85. A preliminary screening was performed on all of the identified sites based on the information obtained from

Table 7
SUMMARY OF WATER QUALITY DATA FROM MASON'S RUN

Parameter	Units	Ranges of Measured Parameter Concentrations	
		Upstream	Downstream
Suspended Solids	mg/l	7-159	12-71
Oil and Grease	mg/l	0-<5	0-<5
Chemical Oxygen Demand	mg/l	7-14	10-12
Copper	mg/l	0.0-0.01	0.0-0.10
Iron	mg/l	0.0-0.5	0.3-5.7
Zinc	mg/l	0.0-2.7	0.0-0.12
Mercury	mg/l	0.0-<0.0001	0.0-0.0002
pH	Standard Units	6.8-7.5	6.9-7.9
Flow	mgd	0.003-0.383	0.020-0.619

Sources: National Pollutant Discharge Elimination System Reports, Columbus Water and Chemical Testing Laboratory Analyses. Period of Record: 1978-1979.

the interviews and available records from the installation and outside agencies. Using the decision tree process described in the "Methodology" section, a determination was made whether a potential exists for hazardous material contamination in any of the identified sites. For those sites where hazardous material contamination was considered significant, a determination was made whether significant potential exists for contaminant migration from these sites. These sites were then rated using the U.S. Air Force Hazard Assessment Rating Methodology (HARM), which was developed jointly by the Air Force, CH2M HILL, and Engineering-Science for specific application to the Air Force Installation Restoration Program. The HARM system considers four aspects of the hazard posed by a specific site: (1) the receptors of the contamination, (2) the waste and its characteristics, (3) potential pathways for waste contaminant migration, and (4) any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating. A more detailed description of the HARM system is included in Appendix G.

A total of nine disposal and spill sites were identified at AF Plant 85. Of these, six were rated using the HARM rating system. A complete listing of all of the sites, indicating potential hazards, is shown in Table 8. Copies of the completed rating forms are included in Appendix H, and a summary of the hazard ratings for the sites is presented in Table 9.

Descriptions of each site, including a brief discussion of the rating results and the most significant factors which contributed to the rating score, are presented below. Approximate locations of the sites are shown in Figure 12.

Table 8
DISPOSAL AND SPILL SITE SUMMARY

Site No.	Site Description	Potential Hazard Contamination	Migration	Rating
1	Magnesium Chip Burn Site	No	No	No
2	Coal Pile Leachate Site	Yes	Yes	Yes
3	PCB Spill Site	Yes	Yes	Yes
4	Fire Department Training Area	Yes	Yes	Yes
5	Mason's Run Oil/Fuel Spill Site	Yes	Yes	Yes
6	Rubble Disposal Site	No	No	No
7	Process Tank Acid Spill	No	No	No
8	James Road Hazardous Waste Storage Pad	Yes	Yes	Yes
9	N.E. Building No. 3 Fuel Tank Site	Yes	Yes	Yes

Table 9
SUMMARY OF DISPOSAL AND SPILL SITE RATINGS

Site No.	Site Description	Subscore (% of Maximum Possible Score in Each Category) Receptors	Characteristics	Pathways	Factor for Waste Management Practices	Overall Score	Page Reference of Site Rating Form
2	Coal Pile Leachate Site	64	40	59	0.95	51	H-1
3	PCB Spill Site	61	60	54	0.95	55	H-3
4	Fire Department Training Area	61	64	54	0.95	57	H-5
5	Mason's Run Oil/Fuel Spill Site	64	32	100	0.95	62	H-7
8	James Road Hazardous Waste Storage Pad	64	60	54	0.95	56	H-9
9	N.E. Building No. 3 Fuel Tank Site	64	32	54	1.0	50	H-11

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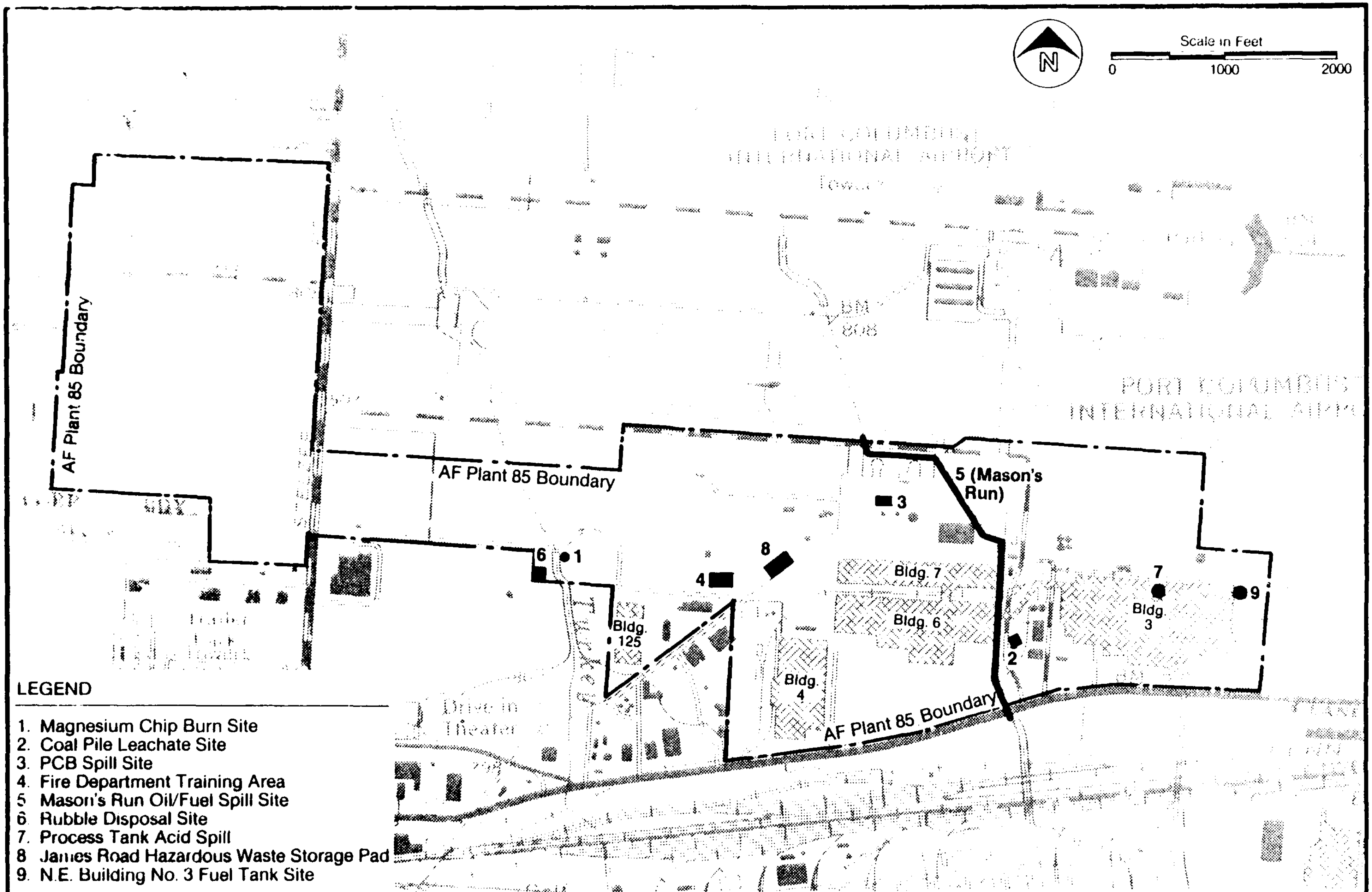


LEGEND

1. Magnesium Chip Burn Site
2. Coal Pile Leachate Site
3. PCB Spill Site
4. Fire Department Training Area
5. Mason's Run Oil/Fuel Spill Site
6. Rubble Disposal Site
7. Process Tank Acid Spill
8. James Road Hazardous Waste Storage Pad
9. N.E. Building No. 3 Fuel Tank Site

FIGURE 12.
Location Map of Identified Disposal and Spill Sites at AF Plant 85.

CH2M HILL

- Site No. 1, the Magnesium Chip Burn Site, was used to burn magnesium chips which were a production byproduct from 1970 to 1972. The site is inactive and has been backfilled. Because magnesium is not considered a hazardous waste and no hazardous waste is known to be associated with this area, this site was not rated.

- Site No. 2, Coal Pile Leachate Site is located at the boilerhouse coal pile. This site has been used for coal storage from 1941 until the present. Leachate containing sulfuric acid, ammonia, and copper had periodically entered Mason's Run until 1979, when an underdrain system leading to a collection sump was installed. Leachate is now pumped from the sump to the industrial WWTP where it is neutralized and discharged to the sanitary sewer.

  The overall HARM rating of this site is 51. The receptors subscore of 64 is primarily due to the population within 1,000 feet of this site, the distance to the nearest well (2,000 feet), the distance to the installation boundary (800 feet), the ground-water use of the uppermost aquifer, and the population served by ground-water supply within 3 miles of the site. The waste characteristics subscore is 40 because this area was used for disposal of a large quantity of high-hazard waste material with a persistence factor of 0.4. The pathways subscore is 59, primarily because of the distance to the nearest surface water (200 feet) and because the site is currently paved.

- Site No. 3, the PCB Spill Site, is located adjacent to Electric Substation 23. On January 27, 1983, several gallons of transformer oil containing PCB leaked onto the concrete pad of the substation and the adjacent ground. The cause of the leak was a drain valve failure. An area 3 feet wide by 12 feet long by 3 inches deep was excavated. The excavated earth was treated as a hazardous waste and hauled offsite. Further excavation of an area 2 feet wider and 6 inches deeper than the original took place. Based on the results of soil sampling and analysis undertaken by the Ohio EPA, final cleanup will include superficial scraping of the remaining excavation and backfilling with low-permeability soils.

  The overall HARM rating score is 55. The receptors subscore is 61, primarily because of the distance to the nearest well (1,000 feet), the ground-water use of the uppermost aquifer, the population within 1,000 feet of the site, the distance to the installation boundary (2,400 feet), and the population served by ground-water supply within 3 miles of the site. The waste characteristics subscore is 60 because of the spillage of a small quantity of high-hazard waste with a persistence factor of 1.0. The pathways subscore of 54 is primarily due to the nearest surface water (75 feet).

- Site No. 4, Fire Department Training Area was used from 1941 to 1977 to conduct fire department training activities. Contaminated aircraft fuel and waste oils were transported to the area in a 500-gallon bowser. Waste magnesium chips from the

production line were also used in the early 1970s as fuel for these fires. At least one training exercise per month was conducted until 1970, after which the frequency of training exercises slowly decreased to zero by 1977. Approximately 900 gallons of fuel was consumed in each training exercise. Protein foam and water were used to extinguish fires prior to 1970. From 1970 to 1977, AFFF was used in these exercises. Most of the materials would have been consumed in the training fires; however, some minor percolation into the ground is assumed to have occurred. In 1977, this training area was deactivated by excavating and replacing earth to a depth of approximately 30 inches.

The overall HARM rating for this site is 57. The receptors subscore of 61 is primarily due to the distance to the nearest well (1,800 feet), the ground-water use of the uppermost aquifer, the population served by ground-water supply within 3 miles of the site, and the distance to the installation boundary (1,600 feet). The waste characteristics subscore of 64 is due to the disposal of a medium quantity of high-hazard waste materials with a persistence factor of 0.8. The pathways subscore is 54, primarily because a storm drain leading to Turkey Run is located next to the site.

- Site No. 5, Mason's Run Oil/Fuel Spill Site, includes the entire length of Mason's Run within AF Plant 85. The stream is channelized within a concrete culvert through most of the plant but discharges to an open ditch near the plant entrance gate near Fifth Avenue. Numerous spills

of miscellaneous oils and fuels have entered Mason's Run by means of the stormwater drainage system from 1941 through 1983. The spills were more frequent in the 1950s and 1960s when flightline operations were prevalent. A few spills or washoff of oils from asphalt surfaces still occur annually. At least four fishkills were reported to have occurred in the 1960s. One fishkill was due to the discharge of powerhouse compressor oil into Mason's Run. The spillage of JP-4 was the cause of three other fishkills. An oil skimmer system and a sand bag dam were installed in approximately 1970 at a point on Mason's Run where the water flows away from the boundary of AF Plant 85.

In addition to miscellaneous oils and fuels, Mason's Run also received approximately 50,000 gallons of coal pile leachate on May 18, 1983. This spill was due to a leak in the coal pile leachate holding tank, located at the industrial WWTP. As a result of this spill, water in Mason's Run became bright orange and temporarily developed a pH of 2.6.

The overall HARM rating of this site is 62. The receptors subscore is 64, primarily because of the distance to the nearest well (400 feet), the distance to the installation boundary (zero feet), and ground-water use of the uppermost aquifer. The waste characteristics subscore is 32 because of the disposal of a medium quantity of low-hazard waste material with a persistence factor of 0.8. The pathways subscore is 100, primarily because the site is a surface-water body subject to flooding.

- Site No. 6, Rubble Disposal Site, was used for the disposal of concrete rubble, which resulted from the damage to buildings caused by a tornado in approximately 1972. The site was excavated, the rubble buried, and the site backfilled. Because no hazardous waste was known to be associated with the rubble disposal, the site was not rated.

- Site No. 7, the Process Tank Acid Spill Site, is located in the chemical milling area of Building No. 3. Approximately 1,600 gallons of hydrochloric acid solution drained from a process tank because of the rupture of a heat exchange pipe. The solution was contained in a diked area equipped with a drain leading to the holding tank of the industrial WWTP. The acid solution was later neutralized by a lime slurry and discharged to the sanitary sewer. Because this hazardous waste was completely contained, this site was not rated.

- Site No. 8, the James Road Hazardous Waste Storage Pad, has been used to store drums of hazardous wastes since 1941. These wastes include 1,1,1-trichloroethane, acetone, mixtures of other organic solvents, and phenolic paint strippers. Several spills have occurred on the ground adjacent to the concrete pad of this site.

  The overall HARM rating for this site is 56. The receptors subscore of 64 is primarily due to the distance to the nearest well (1,250 feet), the distance to the installation boundary (500 feet), and the ground-water use of the uppermost aquifer. The waste characteristics subscore is 60 due to spills of a small quantity of high hazard waste

materials with a persistence factor of 1.0. The pathways subscore is 54, primarily because of the distance of approximately 150 feet to a storm drain leading to Turkey Run.

- Site No. 9, N.E. Building No. 3 Fuel Tank Site, is the location of five underground steel fuel storage tanks. Two tanks, each with a capacity of 15,000 gallons, were used for JP-4 storage. The three remaining tanks, each with a capacity of 2,000 gallons, were formerly used to store AVGAS. Two are now filled with water, and the other contains waste oil. Several sources have indicated that these tanks may leak because of their age.

  The overall HARM rating for this site is 50. The receptors subscore of 64 is due to the distance to the nearest well (1,500 feet), the distance to the installation boundary (600 feet), and the groundwater use of the uppermost aquifer. The waste characteristics subscore is 32 because this area may have been exposed to a small quantity of high hazard waste materials with a persistence factor of 0.8. The pathways subscore is 54, primarily because a storm drain leading to Mason's Run is within 50 feet.

C. ENVIRONMENTAL STRESS

During the November 1983 site visit, major known former or present disposal areas were examined for signs of vegetative stress possibly related to the presence or migration of hazardous wastes. No signs of stress were detected during this investigation.

V. CONCLUSIONS

V. CONCLUSIONS

A. Information obtained through interviews with 25 past and present personnel, installation records, and field observations indicates that hazardous wastes have been disposed of on AF Plant 85 property in the past.

B. No evidence of environmental stress resulting from past disposal of hazardous wastes was observed at AF Plant 85.

C. Indirect evidence (confirmed by visual observation of oil sheen) of contaminant migration exists at Site No. 5, Mason's Run Oil/Fuel Spill Site.

D. The potential for surface-water migration of hazardous contaminants is relatively high at AF Plant 85 due to the relatively high annual precipitation rate, the low permeability of the site soils, the extensive paved areas, the resulting high stormwater runoff, and proximity to surface drainages.

E. The potential for ground-water migration of hazardous migration is moderately low primarily due to: (1) soil permeabilities of approximately 4×10^{-5} to 4×10^{-4} cm/sec and (2) a ground-water table up to 50 feet deep. The potential exists, however, due to: (1) the absence of a continuous low-permeability confining stratum in the unsaturated zone, and (2) the presence of numerous abandoned wells which, if improperly sealed, may act as a direct pathway. The potential for contaminant migration is higher in areas where a hydraulic driving force may be present at times. Such areas include storm drainage ditches (Mason's Run) and the fire department training area.

F. Table 10 presents a priority listing of the rated sites and their overall scores. The following sites were designated as areas showing the most significant potential (relative to other AF Plant 85 sites) for environmental impact:

1. <u>Site No. 5, Mason's Run Oil/Fuel Spill Site</u>

   This stream has received numerous miscellaneous oils and fuels from storm sewers since the inception of AF Plant 85. Several fish kills were reported in Mason's Run outside plant boundaries in the 1960's. An oil skimmer system and a sand bag dam were installed approximately 15 years ago. Spills have been less frequent as flightline operations ceased and housekeeping has improved. A spill of approximately 50,000 gallons of coal pile leachate occurred in May 1983. Indirect evidence of contamination observed during the site visit included an oil sheen on the water surface near the oil separator.

2. <u>Site No. 4, Fire Department Training Area</u>

   This area was used from 1941 to 1977 for the disposal of contaminated aircraft fuels, waste oils, and waste magnesium chips. In 1977, the soil was excavated to a depth of approximately 30 inches and backfilled with earth materials. No sampling or analysis of the soil left in place was conducted.

3. <u>Site No. 8, James Road Hazardous Waste Storage Pad</u>

   This concrete pad has been used to store drums of hazardous waste since 1941. Several spills have

Table 10
PRIORITIZED LISTING OF DISPOSAL AND SPILL SITES

Ranking No.	Site No.	Description	Overall Score
1	5	Mason's Run Oil/Fuel Spill Site	62
2	4	Fire Department Training Area	57
3	8	James Road Hazardous Waste Storage Pad	56
4	3	PCB Spill Site	55
5	2	Coal Pile Leachate Site	51
6	9	N.E. Building No. 3 Fuel Tank Site	50

occurred on the ground adjacent to the pad, although no visual evidence of contamination was found during the site visit.

4. Site No. 3, PCB Spill Site

Site No. 3 is the location of a spill of several gallons of transformer oil containing PCB's. The spill occurred in January 1983 adjacent to Electric Substation 23. This site was excavated twice, resulting in an excavation 12 feet long by 5 feet wide by 9 inches deep. Based upon the results of soils analyses performed by the Ohio EPA, final clean-up will include superficial scraping of the area followed by backfilling with low-permeability soils. After this final excavation is accomplished, Ohio EPA has indicated that the site will have been satisfactorily cleaned up.

5. Site No. 2, Coal Pile Leachate Site

Site No. 2, located adjacent to the boilerhouse, has been used for coal storage since 1941. Coal pile leachate containing sulfuric acid, ammonia, and copper periodically entered Mason's Run until 1979, when an underdrain/collection system was installed.

6. Site No. 9, N.E. Building No. 3 Fuel Tank Spill

Site No. 6 is the location of five UG fuel storage tanks which are adjacent to the northeast corner of Building No. 3. Two 15,000-gallon tanks were used to store JP-4. Three 2,000-gallon tanks were

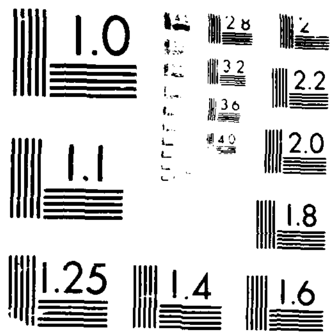
used for AVGAS storage; two are now filled with water, and the third now contains waste oil. The ground above the tanks is asphalt-covered, and no visual evidence of contaminants was found during the site visit, but Rockwell International employees have speculated that these tanks may have developed leaks because of their age.

G. The remaining sites that were not rated (Sites No. 1, 6, and 7), are not considered to present significant environmental concerns.

VI. RECOMMENDATIONS

AD-A191 021 INSTALLATION RESTORATION PROGRAM RECORDS SEARCH FOR AIR 2/2
FORCE PLANT 85 OHIO(U) CH2M HILL INC GAINESVILLE FL
FEB 84 AFESC/DEV-85-IRP-001 F08637-80-G-0010-5004

UNCLASSIFIED F/G 24/4 NL



MICROCOPY RESOLUTION TEST CHART

VI. RECOMMENDATIONS

A. PHASE II PROGRAM

A limited Phase II monitoring program is recommended to confirm or rule out the presence and/or migration of hazardous contaminants. The priority for monitoring at those sites which are high on the prioritized list (see Table 10) is considered moderate.

Tables 11 and 12 present a summary of recommended monitoring sites, parameters to be measured, and the rationale for the analyses. Specifically, sampling is recommended for Site No. 5, Mason's Run Oil/Fuel Spill Site; Site No. 4, Fire Department Training Area; Site No. 8, James Road Hazardous Waste Storage Pad; and Site No. 3, Coal Pile Leachate Site. Soil sampling and analysis are already underway at Site No. 3, PCB Spill Site. The approximate monitoring locations are shown in Figure 13.

1. Site No. 5, Mason's Run Oil/Fuel Spill Site

A monitoring well should be installed to determine if hazardous contaminants are present in the ground water. The well should be located on the west bank of Mason's Run across from the oil skimmer. The well should be drilled to the top of bedrock (approximately 85 feet) and screened 10 feet above the water table to the bottom of the well. The well should be analyzed for the parameters shown in Table 11 and should be sampled on two occasions at least 30 days apart to determine the presence of contaminants. Sediment samples and water samples should also be collected from Mason's Run at the same time as the well samples and analyzed for the parameters shown in Table 11. The water

Table 11
RECOMMENDED PHASE II ANALYSES

Sample Type	TOX[a] or VOC[b]	Heavy Metals	Phenols	COD, TOC and Oil and Grease	pH	Hydrogen Sulfide
Monitoring Wells						
Site No. 2--Coal Pile Leachate Site		X			X	X
Site No. 5--Mason's Run Oil/Fuel Spill Site	X	X	X	X	X	
Soil Sampling						
Site No. 8--James Road Hazardous Waste Storage Pad	X	X	X	X		
Site No. 4--Fire Department Training Area	X	X	X	X		
Surface-Water Sampling						
Site No. 5--Mason's Run Oil/Fuel Spill Site	X	X	X	X	X	
Bottom Sediment Sampling						
Site No. 5--Mason's Run Oil/Fuel Spill Site	X	X	X	X		

[a]TOX -- Total Organic Halogens

[b]VOC -- Volatile Organic Compounds

Table 12
RATIONALE FOR RECOMMENDED ANALYSES

Parameter	Rationale
Total Organic Halogens (TOX) or Volatile Organic Compounds (VOC)	Organic solvents used onsite (past and present); persistent components of fuels and other POL products, e.g., benzene and toluene.
Heavy Metals (lead, copper, chromium, and cadmium)	Potential sources identified (leaded fuel, plating wastes, and coal pile leachate).
Phenols	Phenolic cleaners and paint strippers used in the past.
COD, TOC, and Oil and Grease	Fuel spill indicators and indicators of non-specific contamination.
pH	Coal pile leachate indicator.
Hydrogen Sulfide	Coal pile leachate indicator.

GN14649 YO

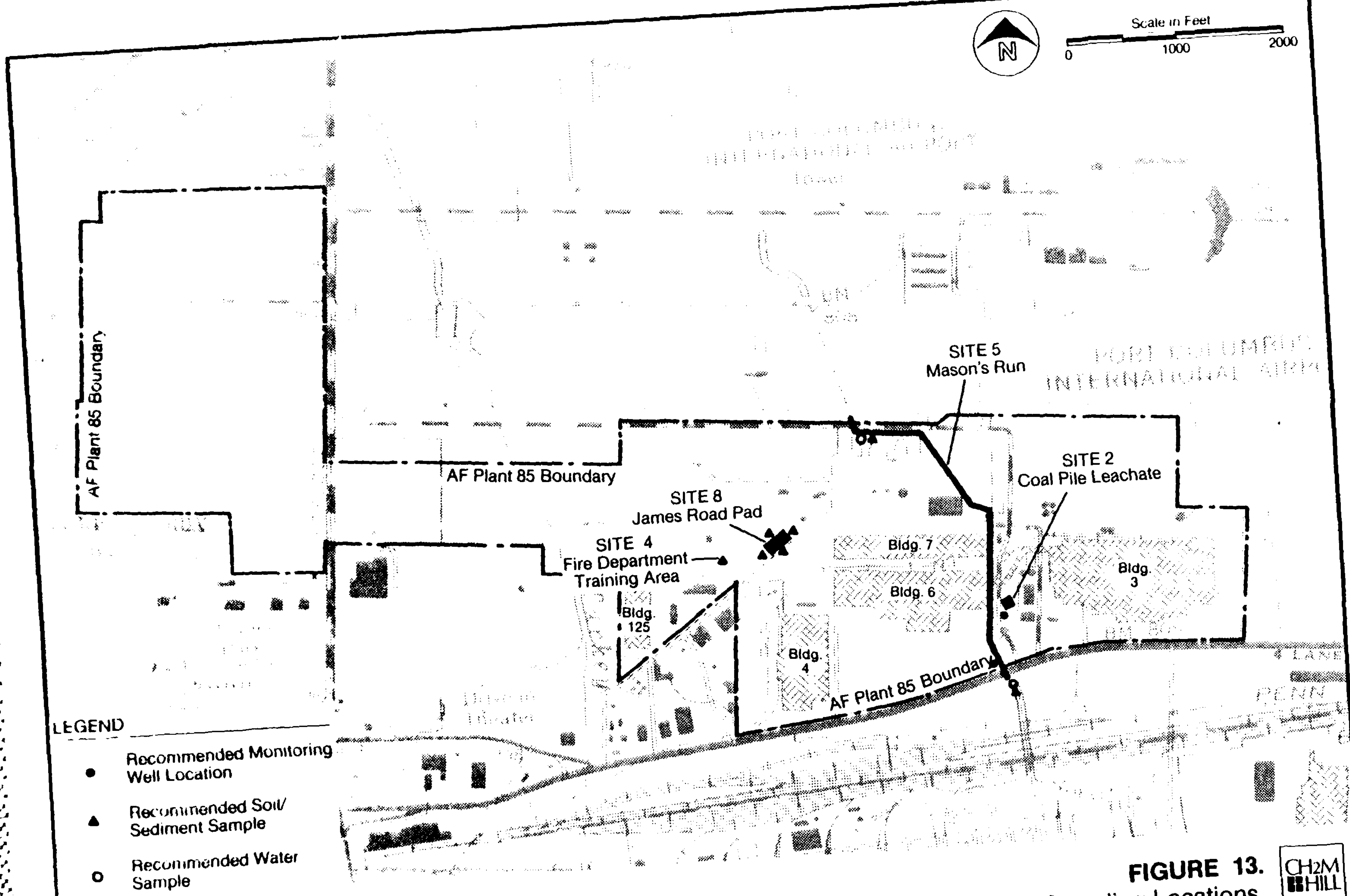


FIGURE 13.
Recommended Preliminary Sampling Locations.

and sediment samples should be taken where Mason's Run first enters AF Plant 85 from Port Columbus International Airport and should also be taken on the south side of 5th Avenue.

2. Site No. 4, Fire Department Training Area

One soil boring should be made near the center of the former training area to a maximum depth of 10 feet. Soil samples should be collected at a minimum of one-foot intervals and analyzed in accordance with Table 11. If ground water is encountered in the boring, analyses should also be completed on a water sample. After sampling has been completed, the borehole should be properly sealed to prevent a pathway for contaminant migration.

3. Site No. 8, James Road Hazardous Waste Storage Pad

Shallow soil samples should be taken at the James Road Hazardous Waste Storage Pad to determine if hazardous waste spills are restricted to the soil surface or have migrated into the soil column. Soil samples should be collected at four locations, i.e., 5 feet outward from the midpoint of each side of the concrete pad, or wherever a spill is visible. Soil samples should be collected at the surface and at one foot below the surface at each location (total of eight soil samples) and analyzed for the parameters presented in Table 11.

4. Site No. 2, Coal Pile Leachate Site

A monitoring well should be installed downgradient of this site to determine if hazardous contaminants are present in the ground water. The well should be drilled to the top of the bedrock (approximately 85 feet) and screened 10 feet above the water table to the bottom of the well.

The well should be analyzed for the parameters given in Table 11 and should be sampled on two occasions at least 30 days apart to determine the presence of contaminants.

A qualified geologist or geotechnical engineer should be present throughout the installation of all borings and ground-water monitoring wells. The geologist should examine the soil samples, log the boring, direct the depth and number of samples to be taken, and inspect for signs of fuel or VOC contamination.

The final details of the Phase II monitoring program, including the exact locations of sampling points, should be determined as part of the Phase II program. In the event that contaminants at levels of serious concern are detected, a more extensive field survey program should be implemented to determine the extent of contaminant migration.

B. OTHER ENVIRONMENTAL RECOMMENDATIONS

Other environmental recommendations that have resulted from the installation site visit and records search include the following:

1. Site No. 9, N.E. Building No. 3 Fuel Tank Site

The integrity of the five UG tanks located at this site should be determined (e.g., by pressure testing for leaks).

2. The integrity of the two tanks located at the Oil House which have been used in the past for storage of TCE and TCE sludges (Tanks No. 146 and 147) should be determined (e.g., by pressure testing for leaks).

3. The removal efficiency of the oil skimmer located at Mason's Run should be determined, and improved if found necessary.

4. A sampling protocol should be developed for Mason's Run in the event of an accidental spill.

Appendix A

RESUMES OF TEAM MEMBERS

BRUCE JAMES HAAS
Senior Geotechnical Engineer

Education

M.S., Civil Engineering, University of Wisconsin
B.S., Civil Engineering, University of Wisconsin
Studies as exchange student, Technische Universitat, Munich, West Germany

Experience

Mr. Haas is responsible for field explorations and geotechnical investigations and for general earthwork design projects. His knowledge of soils, sitework, and construction procedures has been instrumental in developing numerous efficient and economical civil engineering designs. Project experience includes hazardous waste disposal, site development, grading and drainage, streets and roadways, and marinas.

Mr. Haas has participated in many hazardous waste disposal projects relating to the Resource Conservation and Recovery Act (RCRA) and the EPA's Superfund Project. For example, he was responsible for geohydrologic reviews of various hazardous waste disposal facilities for the Agrico Chemical Company. These projects involved assessment of the groundwater pollution potential, designs of monitoring systems, and preparation of closure and post-closure plans for agricultural chemical plants in Oklahoma, Louisiana, and Florida. During another project, two related sites located northwest of Baton Rouge, Louisiana were used for the disposal of large quantities of hazardous petrochemical wastes; Mr. Haas provided technical assistance to the U.S. EPA in the enforcement of the Superfund cleanup litigation effort. Mr. Haas participated in the evaluation of existing subsurface investigation data, assessments of alternative closure strategies, and development of detailed plans for additional remedial investigation.

Currently, Mr. Haas is project manager in charge of the design of cap, cover, and drainage system improvements for the Taylor Road Landfill in Hillsborough County, Florida. The site is a closed sanitary landfill which is listed on the U.S. EPA Superfund list.

Mr. Haas has provided geohydrologic reviews including assessment of groundwater pollution potential, design of monitoring systems, and preparation of closure and post-closure plans for Agrico Chemical Company, Donaldsonville, Louisiana; and the Cities of Verdigris, Oklahoma; Blytheville, Arkansas; and South Pierce, Florida.

He has also participated in geohydrologic and hazardous waste evaluations of former waste disposal practices in conjunction with the Air Force Installation Restoration Program at five Air Force Bases: MacDill AFB, Tampa, Florida; Tyndall AFB, Panama City, Florida; Dobbins AFB, Marietta, Georgia; Moody AFB, Valdosta, Georgia; and Richards-Gebaur AFB, Kansas City, Missouri. He also performed a geohydrologic survey, an assessment of the pollution potential and monitoring well installation for an industrial smelting operation in Alabama and for the Vulcan Asphalt Company, Cordova, Alabama.

Mr. Haas designed the cover system associated with leachate collection system modifications on the Love Canal Project 1, Niagara Falls, New York. Various cover alternatives were evaluated, including synthetic membranes, soil-bentonite, natural clay, and sprayed asphalt. Mr. Haas developed details for the selected cover system consisting of either a hypalon or high-density polyethylene membrane protected with 18 inches of silty sand. Difficult site grading conditions and subgrade preparations below the cover were critical to the design.

The Lipari Landfill is a former hazardous waste disposal site near Pitman, New Jersey, which had been oozing highly contaminated leachate into an adjacent stream. Mr. Haas served as project geotechnical engineer responsible for evaluating alternative closure methods and materials for a groundwater cut-off wall and cover. Complete drawings and specifications were prepared for the selected remedial action, which included a 3,000-foot-long soil bentonite slurry trench up to 55 feet deep around the contaminated area, and a 16-acre cover consisting of high-density polyethylene or compacted clay with a 24-inch protective soil cover and associated site grading, grassing, storm drainage, and gas venting systems.

Professional Registration

Professional Engineer, Florida, Wisconsin

Membership in Professional Organizations

American Society of Civil Engineers

Publications

With T. B. Edil. "Proposed Criteria for Interpreting Stability of Lakeshore Bluffs." Engineering Geology. 1980.

THOMAS A. RIDCIK
Sanitary Engineer

Education

M.S., Environmental Engineering, University of North Carolina

B.S., Chemical Engineering, Rutgers University

Experience

Mr. Ridgik is a project engineer in the Water and Wastewater Discipline. Since joining CH2M HILL, his responsibilities have involved primarily wastewater treatment plant (WWTP) hydraulic analysis, sludge dewatering facility design, flow projections, water treatment plant predesign, alternate disinfection study, and softener/clarifier design.

Mr. Ridgik has performed the preliminary hydraulic designs for several wastewater plants. These include the Fort Pierce, Florida, WWTP, with a peak month design flow of 9.2 million gallons per day (mgd), the Moss Point/Pascagoula, Mississippi WWTP, with a 12.2-mgd peak month design flow, and the Grand Strand, South Carolina Interim WWTP Plant "A," a 0.5-mgd facility.

Mr. Ridgik developed the preliminary design of sludge dewatering facilities for the Moss Point/Pascagoula, Mississippi WWTP, a 12.2-mgd peak month facility. Design included selecting belt filter presses, polymer conveying and mixing equipment, sludge pumps, and other appurtenances, and developing the building layout. He also performed the complete design of lime sludge dewatering beds for the Port Malabar, Florida, Water Treatment Plant as part of its expansion from 3.0 to 6.0 mgd. Tasks included evaluating the cost-effectiveness of drying beds versus mechanical dewatering, sizing and designing the beds and underdrains, and designing the filtrate return pumping scheme.

Mr. Ridgik performed a flow projection analysis as part of the Port Malabar, Florida, WTP expansion. Flows were projected starting with the present average day consumption of 2.0 mgd to buildout consumption in excess of 30 mgd. In addition to developing per capita flows and projecting populations, he was responsible for the disaggregation of water consumption into domestic and industrial sectors in order to reflect their differing growth rates.

Mr. Ridgik was the principal author of the predesign report for the expansion of the Port Malabar, Florida, WTP from 3.0 mgd to 6.0 mgd. Tasks included developing flow projections, evaluating the existing facilities, and recommending

the required equipment, which included new softening/clarifier units, a rapid sand filter, transfer and high service pumping, and ground storage.

Mr. Ridgik was the project engineer in an alternative disinfectant field study designed to control trihalomethane formation for the Englewood Water District, Englewood, Florida. A 3-month study was conducted in which chlorine dioxide and chloramines were compared with chlorine on a plant-scale basis. Tasks included generating chlorine dioxide and/or chloramines onsite and coordinating and analyzing the tests for the parameters under investigation. These parameters included bacteriological quality, trihalomethane formation, side product formation, color removal, and residual disinfectant levels.

Mr. Ridgik was lead design engineer for the installation of two new softener/clarifier units as part of the Port Malabar, Florida, WTP expansion from 3.0 mgd to 6.0 mgd. He also designed the lime storage, slaking, and pumping system for these units.

Before joining CH2M HILL, Mr. Ridgik was a graduate research assistant in the University of North Carolina Department of Environmental Sciences and Engineering. He developed improved computer programs for design of water distribution networks in developing countries for a World Bank project and was a teaching assistant for a course in planning and design of low-cost water supply systems.

Prior to his graduate studies, Mr. Ridgik was employed as a sanitary engineer with the U.S. Public Health Service in Morgantown, West Virginia. His major responsibilities included testing and certification of gas detector tubes.

Mr. Ridgik was formerly a Peace Corps Volunteer in Ethiopia in association with the World Health Organization's Smallpox Eradication Program. Before joining the Peace Corps, he was a Process Development Engineer with M & T Chemicals, Rahway, New Jersey, where he supervised production of small quantities of various organic compounds, improved the manufacturing processes for large-scale production, and directed startup of new processes as they were transferred from pilot plant to full-scale manufacturing operations.

Professional Registration

Professional Engineer, West Virginia

THOMAS A. RIDGIK

Membership in Professional Organizations

American Water Works Association
American Society of Civil Engineers
Water Pollution Control Federation

Publications

With O.K. Buros, C.R. Sproul, M.R. Vilaret, and R.A. Yorton. "Florida Style Water Supply and Treatment." WATER/Engineering and Management. April 1982, pp. 30-33.

With D.T. Lauria. Heuristic Model for Looped Water Networks. Presented at the American Water Works Annual Conference. June 1981.

With W. Jones. "Nitric Oxide Oxidation Method for Field Calibration of Nitrogen Dioxide Meters." American Industrial Hygiene Association Journal, 41:433-436. 1980.

With R.C. Ahlert, R.L. Peskin, and J.W. Gaston, Jr. Interaction of Droplet Size Ignition Requirements in External Burning. Presented at the American Institute of Aeronautics and Astronautics, 6th Propulsion Joint Specialist Conference. June 1970.

GNRE2

THOMAS C. EMENHISER
Environmental Scientist

Education

B.S., Chemistry, University of Florida

Experience

Mr. Emenhiser is an environmental scientist in CH2M HILL's Industrial Processes Discipline. His primary responsibilities involve industrial wastewater treatment, hazardous waste assessment, and water quality investigations. He has worked on a wide variety of projects and has a broad range of experience in several technical areas.

Mr. Emenhiser has been the field manager for several industrial wastewater characterization and treatability studies, including those conducted for Engelhard Industries at Attapulgus, Georgia; and Hercules, Inc., at their Gibbstown, N.J. and Brunswick, Georgia facilities. His responsibilities on these projects included the characterization of the strength and quantity of wastewater streams to determine their overall pollutant load and the evaluation of alternative experimental techniques (e.g., dissolved air flotation, activated carbon adsorption, jar test coagulation, and bench-scale biological reactors) for development of the optimum treatment/disposal system for the respective facilities.

Mr. Emenhiser has been involved in several process designs for industrial wastewater treatment facilities and spent 6 months in Caracas, Venezuela completing a preliminary design on the treatment of upgrader and produced wastewaters for the Lagoven Oil Company.

During the last 2 years Mr. Emenhiser has been involved in several projects associated with the EPA's RCRA and Superfund programs. He was the project team leader for the Biscayne Aquifer groundwater sampling project. This project required groundwater sampling of 120 wells in the Miami area in accordance with EPA sampling protocol, including maintenance of field notebooks, chain of custody records, and organic/inorganic traffic reports.

Mr. Emenhiser also has extensive experience in surface-water quality investigations. He has been involved in limiting nutrient investigations and non-point source water quality and quantity studies for the Florida Sugar Cane League, Deseret Ranches, and Jacksonville Suburban Utilities.

THOMAS C. EMENHISER

Membership in Professional Organizations

Water Pollution Control Federation
Florida Pollution Control Association

Publications

"Anaerobic-Aerobic Biopond Treatment of Sugarcane Mill Process Wastewaters," co-authored with Earl E. Shannon and J. J. Smith, Jr. Presented at the 52nd Annual Conference of the Water Pollution Control Federation, Houston, Texas, 1979.

"Effects of Hydrogen Sulfide in Florida Groundwaters," co-authored with Ross Sproul. Presented at the Third Annual Groundwater Symposium sponsored by the Northwest Florida Water Management District.

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Appendix B

OUTSIDE AGENCY CONTACT LIST

Appendix B
OUTSIDE AGENCY CONTACT LIST

1. U.S. Department of Agriculture
   Soil Conservation Service of Franklin County
   Columbus, Ohio
   614/469-6962

2. U.S. Department of the Interior
   Geological Survey
   Columbus, Ohio
   614/469-5553

3. Ohio Department of Natural Resources
   Division of Water
   Columbus, Ohio
   Mr. James Schmidt
   614/165-6717

4. Ohio Department of Natural Resources
   Division of Preserves and Natural Areas
   Columbus, Ohio
   Ms. Patricia Jones
   614/265-6453

5. Ohio Department of Natural Resources
   Division of Wildlife
   Columbus, Ohio
   Mr. Paul Woner
   614/265-7037

6. Ohio Environmental Protection Agency
   Division of Public Water Supply
   Columbus, Ohio
   Ms. Karen Leopold
   614/466-8307

7. Ohio Environmental Protection Agency
   Department of Health
   Columbus, Ohio
   Mr. Glenn Hackett
   614/466-1390

8. Ohio Environmental Protection Agency
   Emergency Response
   Columbus, Ohio
   Ms. Marilyn McCoy
   614/466-5664

9. Ohio Environmental Protection Agency
   Division of Wastewater Pollution Control
   Columbus, Ohio
   Mr. Bruce Goff
   614/466-6035

10. Ohio Environmental Protection Agency
Division of Industrial Pretreatment
Columbus, Ohio
Mr. Morris Azose
614/462-6795

11. Ohio Environmental Protection Agency
Division of Hazardous Materials
Columbus, Ohio
Mr. Lundy Adelsberger

12. Ohio Environmental Protection Agency
Division of Land Pollution Control
Columbus, Ohio
Mr. Duane Snyder
614/462-8392

13. U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Climatic Data Center
Asheville, North Carolina
704/259-0682

14. U.S. Department of the Interior
Fish and Wildlife Division
Columbus, Ohio
Mr. Ken Multerer
614/231-3416

15. Franklin County Board of Health
Columbus, Ohio
Mr. Joe Weaver
614/462-3160

16. City of Columbus
Water Department
Columbus, Ohio
Mr. Jerry Francis; Mr. Ken Cosens
614/222-7677; 614-6029

17. Port of Columbus Airport
Columbus, Ohio
Mr. Ron Barr, Airport Engineer
614/239-4011

18. City of Columbus
Surveillance Division
Columbus, Ohio
Mr. George Newell
614/222-7016

Appendix C

AF PLANT 85 RECORDS SEARCH INTERVIEW LIST

Appendix C

AF PLANT 85 RECORDS SEARCH INTERVIEW LIST

Interviewee	Area of Knowledge	Years at Installation
1	Personnel Safety	31
2	Personnel Safety	32
3	Welding, Honeycomb	32
4	Chem Mill, Plating, Anodizing	32
5	Facilities Planning	28
6	Plant Services (Exterior)	30
7	Plant Services (General)	32
8	Plant Services (Plumbing)	33
9	Plant Services (Plumbing)	20
10	Plant Services (Contracts)	20
11	Paint Shop	32
12	Fire Department	30
13	Aircraft Sealing/Flightline	31
14	Facilities (Utilities)	30
15	Facilities (Plant Layout)	42
16	Kirksite and Lead Smelting	42
17	Product Development Laboratories	31
18	Wastewater Treatment	3
19	Wastewater Treatment	2
20	Maintenance Garage	32
21	Facilities (Environmental Coordinator)	2
22	USAFPRO (Environmental Coordinator)	32
23	Quality Control Engineering Lab	3
24	Quality Control Engineering Lab	30
25	Paint Shop	33

Appendix D

INSTALLATION HISTORY

Appendix D
INSTALLATION HISTORY

The information regarding the history of Air Force Plant 85 was obtained from the Naval Plant Representative Office Resources Management Guide and from onsite interviews.

The first contractor for AF Plant 85 was the Curtiss-Wright Corporation. Construction of the first major building, Plant Number 3, began in November 1940 by PLANCOR, the Defense Plant Corporation, a subsidiary of the Reconstruction Finance Corporation. Dedication services were held in December 1941. The purpose of the plant was to produce naval aircraft during World War II. Aircraft produced were the SO3C, a Naval Scout Observation plane, and the SB2C, the Naval Fighter also known as the "Helldiver". The SO3C was produced from March 1942 through January 1944, with a total of 800 accepted for service. SB2C production started in September 1942. By the end of 1944, approximately 3,500 had been produced. At the end of World War II, aircraft in production included the SB2C-5 and the XBT2C, an experimental torpedo bomber. During World War II, employment at Curtiss-Wright reached a peak of over 24,000. Aircraft production after World War II declined substantially. Nevertheless, in 1946, three experimental models, the XBT2C, the XSC-2, and the XP-87, were under production. The XP-87 was the first aircraft produced under contract for the U.S. Army Air Corps. After 1946, C-46 and B-29 aircraft were overhauled under contract to the now U.S. Air Force. Because aircraft production continued to decline, Curtiss-Wright discontinued operating at AF Plant 85 in November 1950.

The Navy took title of Building 3, the original Number 3 plant, from PLANCOR in 1950. Building 3 became the Naval Industrial Reserve Aircraft Plant (NIRAP). The

Lustron Corporation, a manufacturer of pre-fabricated homes leased Buildings 6 and 7, then 3A and 3B, respectively, from the RFC. After the Lustron Corporation declared bankruptcy, these buildings were requisitioned by the Navy in April 1951, and were incorporated into the NIRAP.

In November 1950, North American Aviation began operations at AF Plant 85, then known as the NIRAP Columbus. Besides assuming a network of B-29s from Curtiss-Wright, North American began production of F-86 Sabre Jets, T-6G Texan Trainers, AJ-2 Navy Attach Bombers, and FJ Series Fury Jets. Throughout the 1950s, the rate of aircraft production remained high. In 1955, F100 Super Sabres were first produced. Production of T-28 Trojans began the following year. The FJ4 was the first aircraft completely designed at the Columbus facility. In 1956 North American began development of the T-25 Buckeye and the A3J Vigilante. In 1956, North American established a missiles project group which played a major role in subsequent development and production of weapons systems for the Army, Air Force, and Navy.

In the 1960s, North American Aviation continued production of Navy aircraft. These aircraft included the T2J and the A3J, which in 1962 were redesignated the T-2 and the A-5, respectively, and derivatives of these aircraft, which included the T-2B, the T-2C, and the RA-5C. The thermodynamics laboratory and the transonic-supersonic wind tunnel were constructed during this decade. The missiles division was involved in developing the Redhead/Roadrunner for the Army, the Hornet for the Air Force, and the Condor for the Navy. The YAT-28E, an experimental version of the T-28B, was developed as a counterinsurgency aircraft. Although test flown in 1963, the YAT-28E never reached the production stage. The OV-10A, a light-armed reconnaissance

aircraft, was developed for counterinsurgency operations. Assigned to Navy, Marine and Air Force units, it was used in southeast Asia. Development of this aircraft began in 1964.

Aircraft production during the 1970s declined substantially. No new weapons systems entered production; however, ongoing development programs included the Condor missile, the YOV-10D, the B-1 Bomber, the Navy V/STOL (XFV-12A), the Army Hellfire, and the Air Force GBU-15. Production in the early and mid-70s included the RA-5C, the B-1 Bomber, the Space Shuttle, the OV-10 and the T-2. The latter two aircraft were produced for foreign military sales. In 1973, North American Rockwell became Rockwell International. Its Columbus Aircraft Division produced the last RA-5C in 1974. By mid-1977, production of the T-2 and the OV-10 had ended. The Navy cancelled the Condor missile program in September 1976. The B-1 Bomber was cancelled the following year. The XFV-12, V/STOL had a major setback in July 1978 with test results far less than anticipated. At the end of the 1970s, there was a major missile development program for the Army Hellfire, and limited production work supporting military and commercial contracts. By 1979, Rockwell employees at AF Plant 85 numbered less than 2,000, the lowest level since Rockwell began operations there.

Workload in the 1980s continues to be on the increase, although the number of Rockwell employees declined to a low of approximately 1,100 in 1981. The contract awarded Rockwell to produce 100 B-1B long range combat aircraft has had considerable impact on AF Plant 85. AF Plant 85 currently produces the nacelles, forward-intermediate fuselage and wing-carry-through for this aircraft. Production began in 1982, and deliveries of these subassemblies for the first B-1B occurred in late 1983.

Total Rockwell employment at AF Plant 85 reached 3,900 in April 1983. Because of the magnitude of the B-1B contract, an Air Force aircraft, the Columbus facility was transferred from jurisdiction of the Navy to the Air Force in 1982, and was designated AF Plant 85. Other projects at AF Plant 85 during the 1980s have included the Missile X Stage IV structure, GBU-15 production, rework of OV-10s, subassemblies for the Space Shuttle, the OV-10D NOS, XFV-12A remedial wing development, the Light Weight Hydraulic System, the Army's Hellfire missile, and subcontract work for Boeing. Boeing subcontract work has included tooling, fuselage skins for the 757 and 767 aircraft, and the Navy Hydrofoil.

Appendix E

MASTER LIST OF INDUSTRIAL OPERATIONS

Appendix E
MASTER LIST OF INDUSTRIAL OPERATIONS

Shop Name	Present Location and Dates (Building No.)		Past Location and Dates (Building No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current Waste Management Methods
Detail Paint Shop (804)	3	1941-Pres.		X	--	Consumed in Process
Paint Stripping Shop (804)	13	1953-Pres.	Concrete Pad North of Building 3	X	X	Drummed and transported off-base
Final Paint Hangar (838)	5	1953-Pres.		--	--	Currently inactive
Metals Clean (804)	3	1941-Pres.		X	X	Neutralized, then discharged to the Sanitary Sewer[a, b]
Aluminum Processing (804)	3	1941-Pres.		X	X	Neutralized, then discharged to the Sanitary Sewer[a, b, c]
Chemical Mill (804)	3	1955-Pres.		X	X	Neutralized, then discharged to the Sanitary Sewer[c]
Degreasing (804)	3	1951-Pres.		X	X	Drummed and transported off-base
Electroplating (804)	3	1941-Pres.		X	X	Neutralized, then discharged to the Sanitary Sewer[a, b, c]
Aircraft Sealing Department (820)	6	1982-Pres.	New Shop	X	X	Drummed and transported off-base
Resistance Welding Cleaning (826)	3					
Phenolic (Honeycomb) Bonding (826)	3	1955-Pres.		X	X	Neutralized, then discharged to the Sanitary Sewer[d]
Product Inspection (954)	3	1941-Pres.		--	--	
Quality Engineering Labs (854)	6	1943-Pres.		X	--	Consumed in process
Quality Engineering (857)	3	1941-Pres.		--	--	
Machined Parts Fabrication (801)	3	1941-Pres.		X	--	Consumed in process
Sheet Metal Parts Fabrication (802)	3	1941-Pres.		X	--	Consumed in process
Sheet Metal Forming (806)	3	1941-Pres.		--	--	
Diffusion Bonding and Welding (808)	3	1955-Pres.		--	--	Currently inactive
Numerical Control Programming (824)	6	1971-Pres.		--	--	
Hydraulics and Tubing (829)	3	1941-Pres.		--	--	
Structural Machining (836)	6	1943-Pres.		--	--	

Appendix E--Continued

Shop Name	Present Location and Dates (Building No.)	Past Location and Dates (Building No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current Waste Management Methods
Advanced Production Fabrication (837)	3 1971-Pres.		--	--	
Intermediate Nacelle Assembly (813)	3 1971-Pres.		--	--	
Space Shuttle Assembly (814)	3 1971-Pres.		--	--	
AFT Nacelle Assembly (815)	3 1971-Pres.		--	--	
Inlet and Final Assembly (817)	3 1971-Pres.		--	--	
Wing Carry Through Assembly (818)	6 1971-Pres.		--	--	
Forward Intermediate Fuselage Assembly (819)	6 1971-Pres.		--	--	
Wire Manufacturing and Mock-Up (822)	4 1953-Pres.		--	--	
Detail Tool Fabrication (803)	3 1941-Pres.		X	X	Drummed and transported off-base
Tool Services (807)	3 1941-Pres.		X	--	Consumed in process
Tool Design (812)	3 1941-Pres.		--	--	
Master Layout and Template Fabrication (827)	3 1941-Pres.		--	--	
Tool Control (830)	3 1941-Pres.		--	--	
Assembly Tool Fabrication (840)	3 1941-Pres.		X	--	Consumed in process
Automatic Fastening (932)	3 1971-Pres.		--	--	
Internal Trucking (828)	9 1941-Pres.		X	X	Stored in waste oil tank north of Building No. [illegible] then transported off-base
Paint Strip Shop (804)	13 1953-Pres.		X	X	Drummed and transported off-base
Powerhouse	8 1941-Pres.		--	--	

[a] Chromium wastes are reduced to trivalent form prior to discharge to the sanitary sewer.

[b] Concentrated acid and alkaline solutions are bulk transported to wastewater treatment plant for neutralization.

[c] Cyanide wastes are transported to holding tank at wastewater treatment plant, then transported off-base by contractor.

Appendix F

INVENTORY OF MAJOR EXISTING POL STORAGE TANKS

Appendix F

INVENTORY OF MAJOR EXISING POL STORAGE TANKS

Industrial Location	Tank No.	Type POL	Capacity (gal)	Aboveground (AG) Underground (UG)	Abandoned (A) To be Abandoned (TBA)
North Ramp	90	JP-4 (Empty)	10,000	UG	TBA
Garage	91	Diesel Oil	15,000	UG	
Garage	92	MOGAS	15,000	UG	
Power House	93	Fuel Oil	15,000	UG	
Power House	94	Fuel Oil	15,000	UG	
Power House	95	Fuel Oil	6,000	UG	
Covered Passage	96	--	15,000	UG	A
Maintenance Bldg.	97	Empty (Cutting Oil Sludge)	10,000	UG	TBA
N.W. Bldg. 3	98	Quench Oil	10,000	UG	TBA
N.W. Bldg. 3	99	Fuel Oil/Coolant Oil	15,000	UG	TBA
N.W. Bldg. 3	100	Fuel Oil/Waste Fuel, Solvents	15,000	UG	TBA
N.W. Bldg. 3	101	Cutting Oil	15,000	UG	TBA
N.W. Bldg. 3	102	--	1,000	--	A
N.E. Bldg. 3	103	JP-4	15,000	UG	TBA
N.E. Bldg. 3	104	JP-4	15,000	UG	TBA
N.E. Bldg. 3	105	--	15,000	UG	A
N.E. Bldg. 3	106	AVGAS (Water)	2,000	UG	TBA
N.E. Bldg. 3	107	AVGAS (Water)	2,000	UG	TBA
N.F. Bldg. 3	108	AVGAS (Waste Oil)	2,000	UG	TBA
Compass Rose G	109	JP-5	15,000	UG	TBA
Compass Rose G	110	JP-5	15,000	UG	TBA
Compass Rose G	111	JP-5 (Water)	15,000	UG	TBA
Power House	115	Fuel Oil	15,000	UG	
Power House	116	Fuel Oil	15,000	UG	
Oil House	146	TCA (Empty)	3,000	UG	
Oil House	147	TCA (Sludge)	5,000	UG	TBA
Final Paint	159	Lacquer (Empty)	2,500	UG	TBA
Final Paint	160	Lacquer (Empty)	2,000	UG	TBA
Fuels Lab	161	JP-4 (Water)	2,000	UG	TBA
Fuels Lab	162	JP-4	2,000	UG	A
Fuels Lab	163	JP-4 (Water)	2,000	UG	TBA
Fuels Lab	164	JP-4 (Water)	2,000	UG	TBA
Fuels Lab	165	Waste JP-4 (Water)	10,000	UG	TBA

Appendix F--Continued

Industrial Location	Tank No.	Type POL	Capacity (gal)	Aboveground (AG) Underground (UG)	Abandoned (A) To be Abandoned (TBA)
Surplus Sales	166	Waste Oil	10,000	UG	
Compass Rose G	215	JP-5	15,000	UG	TBA
Test Cell	239	JP-5 (Water)	10,000	UG	TBA
Test Cell	240	JP-5 (Water)	10,000	UG	TBA
Test Cell	243	Waste Fuel	5,000	UG	TBA
Test Cell	257	AVGAS	20,000	--	A
Fuels Lab	274	AVGAS	5,000	UG	
Thermo Lab	279	Fuel Oil	7,500	AG	
Covered Passage	287	Waste Oil	6,000	UG	
Sound Abatement	289	Fuel Oil	3,400	UG	TBA
Production Test Cell	290	Fuel Oil	5,000	UG	TBA
Flightline	297	Waste Fuel	1,500	UG	

Appendix G

HAZARD ASSESSMENT RATING METHODOLOGY

USAF INSTALLATION RESTORATION PROGRAM
HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DoD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DoD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from the USAF Occupational and Environmental Health Laboratory (OEHL), Air Force Engineering and Services Center (AFESC), Engineering-Science (ES) and CH2M HILL. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of

USAF OEHL, AFESC, various major commands, Engineering Science, and CH2M HILL met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD program needs.

The model uses data readily obtained during the Record Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly

no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DoD properties.

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure 1). The site rating form is provided on Figure 2 and the rating factor guidelines are provided in Table 1.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, the potential pathways for waste contaminant migration, and any efforts to contain the contamination. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

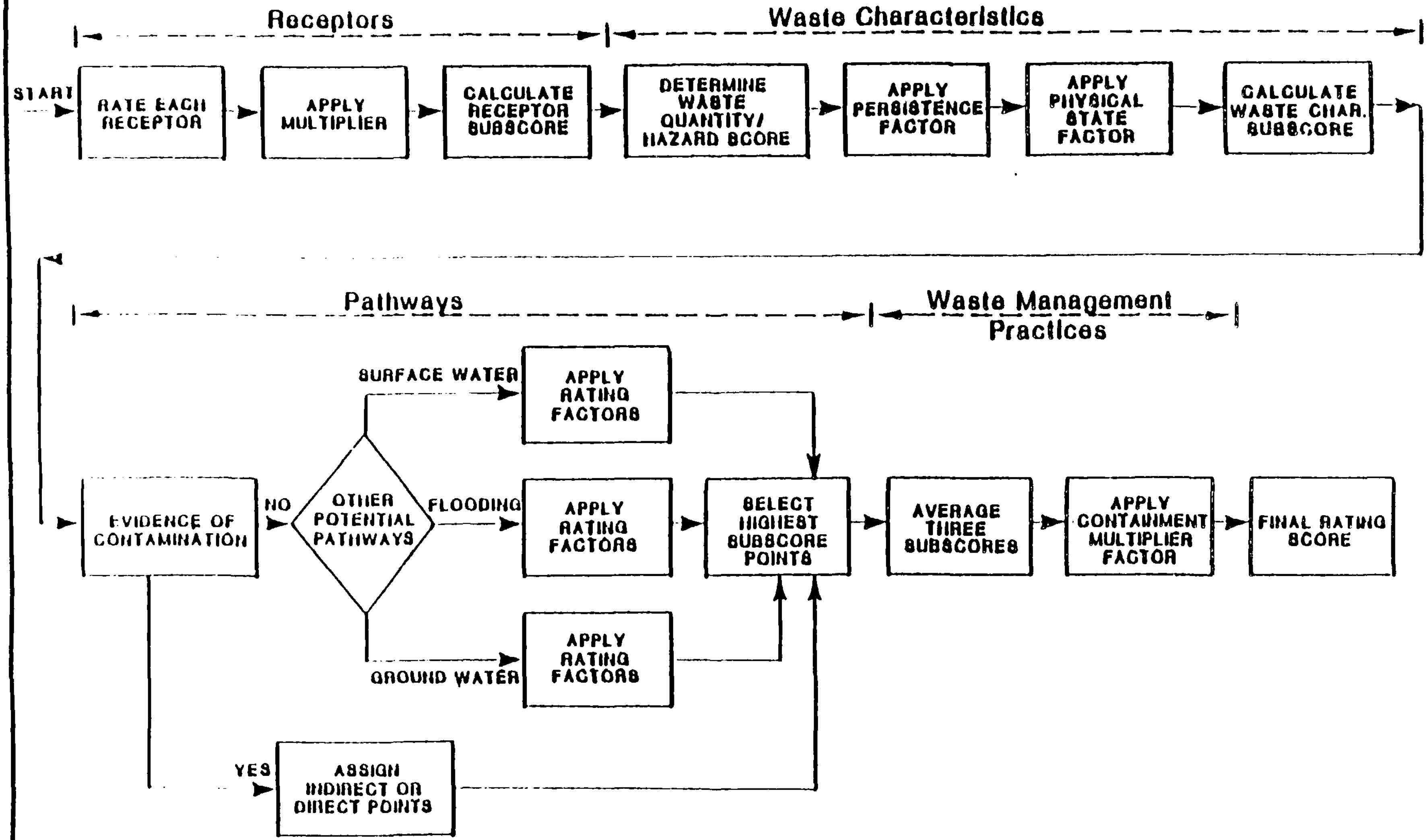
The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant, and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface-water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites at which there is no containment are not reduced. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

HAZARD ASSESSMENT RATING METHODOLOGY FLOW CHART



FIGURE

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE ______________________

LOCATION ______________________

DATE OF OPERATION OR OCCURRENCE ______________________

OWNER/OPERATOR ______________________

COMMENTS/DESCRIPTION ______________________

SITE RATED BY ______________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
Subtotals			______	______

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ______

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______
2. Confidence level (C = confirmed, S = suspected) ______
3. Hazard rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
Subtotals			______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
Subtotals			______	______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ______

Table 1
HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or Industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground-water use of uppermost aquifer	Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-15	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

Table 1--Continued

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level
- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels.

Waste Hazard Rating
- o Wastes with the same hazard rating can be added.
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Multiply Point Rating Persistence Criteria	From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

Table 1--Continued

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)	S = Suspected confidence level
o Verbal reports from interviewer (at least 2) or written information from the records	o No verbal reports or conflicting verbal reports and no written information from the records
o Knowledge of types and quantities of wastes generated by shops and other areas on base	o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

	Rating Scale Levels			
Rating Factors	0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

Table 1--Continued

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($>10^{-6}$ cm/sec)	6
Rainfall intensity based on 1-year 24-hour rainfall	<1.0 inch	1.0 to 2.0 inches	2.1 to 3.0 inches	>3.0 inches	8

B-2 Potential for Flooding

Rating Factors	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Ground-Water Contamination

Rating Factors	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to + 20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay ($<10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8

Table 1--Continued

B-3 Potential for Ground-Water Contamination--Continued

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1, or III-6-3, then leave blank for calculation of factor score and maximum possible score.

AF

Appendix H

SITE RATING FORMS

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Coal Pile Leachate Site

LOCATION: Site No. 2, Air Force Plant 85, Columbus, Ohio

DATE OF OPERATION OR OCCURRENCE: 1941-1979

OWNER/OPERATOR: Air Force Plant 85

COMMENTS/DESCRIPTION: Waste Materials, Acidic Solutions, Sulfur Compounds, Ammonia, Suspended Solids

SITE RATED BY: Tom Emenhiser, Bruce Haas, Tom Ridgik

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	3	4	12	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	1	10	10	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	115	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 64

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L

2. Confidence level (C = confirmed, S = suspected) C

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

100 x 0.4 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
		Subtotals	64	108
Subscore (100 x factor score subtotal/maximum score subtotal)				59
2. Flooding	0	1	0	3
		Subscore (100 x factor score/3)		0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	22	114
Subscore (100 x factor score subtotal/maximum score subtotal)				19

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 59

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	64
Waste Characteristics	40
Pathways	59
Total [illegible] divided by 3 =	54

Gross Total Sc

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

54 x 0.95 = 51

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: PCB Spill Site

LOCATION: Site No. 3, Air Force Plant 85, Columbus, Ohio

DATE OF OPERATION OR OCCURRENCE: January 27, 1983

OWNER/OPERATOR: Air Force Plant 85

COMMENTS/DESCRIPTION: Waste Materials, Transformer Oil Containing PCBs

SITE RATED BY: Tom Emenhiser, Bruce Haas, Tom Ridgik

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	3	4	12	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	1	10	10	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	109	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S

2. Confidence level (C = confirmed, S = suspected) C

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	--	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	30	114
Subscore (100 x factor score subtotal/maximum score subtotal)				26

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 54

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	61
Waste Characteristics	60
Pathways	54
Total 175 divided by 3 =	58
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

58 x 0.95 = 55

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Fire Department Training Area

LOCATION: Site No. 4, Air Force Plant 85, Columbus, Ohio

DATE OF OPERATION OR OCCURRENCE: 1941-1975

OWNER/OPERATOR: Air Force Plant 85

COMMENTS/DESCRIPTION: Waste Materials, Waste Oils, Waste Fuels, Magnesium

SITE RATED BY: Tom Emenhiser, Bruce Haas, Tom Ridgik

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	3	4	12	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	1	10	10	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	109	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M

2. Confidence level (C = confirmed, S = suspected) C

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 0.8 = 64

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

64 x 1.0 = 64

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. *Ground-water migration*				
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	30	114
Subscore (100 x factor score subtotal/maximum score subtotal)				26

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 54

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	61
Waste Characteristics	64
Pathways	54
Total 179 divided by 3 =	60
	Gross Total Sco

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

60 x 0.95 = 57

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Mason Run Oil/Fuel Spill Site

LOCATION: Site No. 5, Air Force Plant 85, Columbus, Ohio

DATE OF OPERATION OR OCCURRENCE: 1941-Present

OWNER/OPERATOR: Air Force Plant 85

COMMENTS/DESCRIPTION: Waste Materials Enter Storm Drainage into Mason Run

SITE RATED BY: Tom Emenhiser, Bruce Haas, Tom Ridgik

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	3	4	12	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	1	10	10	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	115	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 64

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M

2. Confidence level (C = confirmed, S = suspected) C

3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 0.8 = 32

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

32 x 1.0 = 32

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	3	8	24	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	82	108
Subscore (100 x factor score subtotal/maximum score subtotal)				76
2. Flooding	3	1	3	3
	Subscore (100 x factor score/3)			3
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	30	114
Subscore (100 x factor score subtotal/maximum score subtotal)				26

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	64
Waste Characteristics	32
Pathways	100
Total 196 divided by 3 =	65
	Gross Total Sc

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

65 x 0.95 = 62

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: James Road Hazardous Waste Storage Pad

LOCATION: Site No. 8, Air Force Plant 85, Columbus, Ohio

DATE OF OPERATION OR OCCURRENCE: 1941-Present

OWNER/OPERATOR: Air Force Plant 85

COMMENTS/DESCRIPTION: Waste Materials, Spills from Stored Drums

SITE RATED BY: Tom Emenhiser, Bruce Haas, Tom Ridgik

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	3	4	12	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	1	10	10	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	115	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 64

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
		Subscore (100 x factor score/3)		0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	30	114
Subscore (100 x factor score subtotal/maximum score subtotal)				26

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 54

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	64
Waste Characteristics	60
Pathways	54
Total 178 divided by 3 =	59
	Gross Total Sc

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

59 x 0.95 = 56

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: N.E. Building No. 3 Fuel Tank Site

LOCATION: Site No. 9, Air Force Plant 85, Columbus, Ohio

DATE OF OPERATION OR OCCURRENCE: 1941-Present

OWNER/OPERATOR: Air Force Plant 85

COMMENTS/DESCRIPTION: Waste Materials, Fuel Leaks Suspected

SITE RATED BY: Tom Emenhiser, Bruce Haas, Tom Ridgik

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	3	4	12	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	1	10	10	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	115	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 64

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S

2. Confidence level (C = confirmed, S = suspected) S

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 0.8 = 32

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

32 x 1.0 = 32

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
		Subtotals	46	114
Subscore (100 x factor score subtotal/maximum score subtotal)				40

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 54

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	64
Waste Characteristics	32
Pathways	54
Total 150 divided by 3 =	50
	Gross Total

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

50 x 1.0 = 50

Appendix I

GLOSSARY OF TERMS

Appendix I
GLOSSARY OF TERMS

ALLUVIUM - A general term for clay, silt, sand, gravel, or similar unconsolidated material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semisorted sediment in the bed of the stream or on its flood plain or delta.

ALODINE TREATMENT - A chemical conversion on metal surfaces.

AQUIFER - A geologic formation, or group of formations, that contains sufficient saturated permeable material to conduct ground water to yield economically significant quantities of ground water to wells and springs.

ARTESIAN - Condition within a ground-water aquifer in which the potentiomeric surface lies above the surface of the zone of saturation. In confined aquifers, an artesian condition exists whenever the level to which water rises in a well is higher than the top of the aquifer.

BOWSER - A small mobile tank used to recover and transport POL products.

CONFINING STRATA - A strata of impermeable or distinctly less permeable material stratigraphically adjacent to one or more aquifers.

CONTAMINANT - As defined by section 104(a)(2) of CERCLA, shall include, but not be limited to, any element, substance, compound, or mixture, including disease causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly

by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformation, in such organisms or their offspring.

DISCHARGE - Process by which water is removed from the saturated zone, together with the associated flow of ground water within the saturated zone toward the point of removal.

DOWNGRADIENT - A direction that is hydraulically down slope. The downgradient direction can be determined through a potentiometric survey or through the evaluation of existing water level elevations referenced to a common datum (mean sea level).

EP TOXICITY - A laboratory test designed to identify a solid waste as hazardous. A liquid extract from the solid waste is analyzed for selected metals and pesticides. If one or more of the parameters tested for is present in concentration greater than a maximum value then the solid waste is considered a hazardous waste in accordance with RCRA definition.

ESCARPMENT - A steep slope or abrupt change in elevation.

EVAPOTRANSPIRATION - Evaporation from the ground surface and transpiration through vegetation.

GLACIAL OUTWASH - Stratified deposits of sand and gravel which were deposited by meltwater streams emerging from a glacier.

GLACIAL TILL - Non-stratified deposits of intermixed hard to dense, clay, sand, stones, and boulders which were deposited directly beneath a glacier.

GROUND WATER - All subsurface water, especially that part that is in the zone of saturation.

HAZARDOUS WASTE (expanded version of the RCRA definition) - A solid waste which because of its quantity, concentration, or physical, chemical or infectious characteristics may -

(A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible, illness; or

(B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed.

LEACHING - The separation or dissolving out of soluble constituents from a rock or ore body by percolation of water.

LOAM - A rich, permeable soil composed of a friable mixture of relatively equal and moderate proportions of clay, silt, and sand particles, and usually containing organic matter (humus) with a minor amount of gravelly material.

MIGRATION (Contaminant) - The movement of contaminants through pathways (ground water, surface water, soil, and air).

NET PRECIPITATION - Mean annual precipitation minus mean annual evapotranspiration. Evapotranspiration is sometimes estimated by pan evaporation measurements.

PD-680 (Type I and Type II) - A military specification for petroleum distillate used as a safety cleaning solvent. The primary difference between PD-680 Type I and Type II is the flash point of the material. The flash points are 100°F and 140°F for PD-680 Types I and II, respectively. Currently, only Type II is authorized for use at Air Force installations.

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

POTENTIOMETRIC SURFACE - An imaginary surface that represents the static head of ground water and is defined by the level to which water will rise in a cased well.

RECHARGE - Process by which water enters the saturated zone, together with the associated flow of ground water within the saturated zone away from the point of entry.

STRATA - Plural of stratum.

STRATUM - A single and distinct layer, of homogeneous or gradational sedimentary material (consolidated rock or unconsolidated earth) of any thickness, visually separable from other layers above and below by a discrete change in the character of the material deposited or by a sharp physical break in deposition, or by both.

UNSATURATED ZONE (Vadose Zone or Zone of Aeration) - A subsurface zone containing water under pressure less than that of the atmosphere, including water held by capillarity;

and containing air or gases generally under atmospheric pressure. This zone is limited above by the land surface and below by the surface of the zone of saturation, (the ground-water table).

UPGRADIENT - A direction that is hydraulically up slope. The upgradient direction can be determined through a potentiometric survey or through the evaluation of existing water level elevations referenced to a common datum (mean sea level).

WATER TABLE - The upper limit of the portion of the ground completely saturated with water.

Appendix J

LIST OF ACRONYMS, ABBREVIATIONS,
AND SYMBOLS USED IN THE TEXT

Appendix J
LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS USED IN THE TEXT

AF	Air Force
AFESC	Air Force Engineering and Services Center
AFFF	Aqueous Film-Forming Foam
AFLC	Air Force Logistics Command
AFSC	Air Force Systems Command
AFPRO	Air Force Plant Representative Office
AG	Aboveground
AGE	Aerospace Ground Equipment
ASD	Aeronautical Systems Division
AVGAS	Aviation Gasoline
Bldg.	Building
bls	Below Land Surface
BOD_5	Biochemical Oxygen Demand (5-day)
°C	Degrees Celsius (Centigrade)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
cm/sec	Centimeters per Second
COD	Chemical Oxygen Demand
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DNR	Department of Natural Resources (State of Ohio)
DoD	Department of Defense
EPA	Environmental Protection Agency
°F	Degrees Fahrenheit
FAA	Federal Aviation Administration
ft/min	Feet per Minute
gal/yr	Gallons per Year
gpd	Gallons per Day
gpm	Gallons per Minute
HARM	Hazard Assessment Rating Methodology
IRP	Installation Restoration Program
JP	Jet Petroleum
lb	Pounds
lb/yr	Pound(s) per Year

MEK	Methyl Ethyl Ketone
mg/l	Milligram(s) per Liter
mgd	Million Gallons per Day
ml	Milliliter
mo.	Month
MOGAS	Motor Gasoline
mph	Miles per Hour
msl	Mean Sea Level
NASA	National Aeronautics and Space Administration
NIRAP	Naval Industrial Reserve Aircraft Plant
NDI	Non-Destructive Inspection
No.	Number
NPDES	National Pollutant Discharge Elimination System
OEHL	Occupational and Environmental Health Laboratory
PCB	Polychlorinated Biphenyls
PLANCOR	Defense Plant Corporation
POL	Petroleum, Oil, and Lubricants
ppm	Parts per Million
RCRA	Resource Conservation and Recovery Act
SCS	Soil Conservation Service
TCA	1,1,1-Trichloroethane
TCE	Trichloroethylene
TDS	Total Dissolved Solids
TOX	Total Organic Halogen
TSS	Total Suspended Solids
UG	Underground
USAF	United States Air Force
USDA	United States Department of Agriculture
VOC	Volatile Organic Compound
WWTP	Wastewater Treatment Plant

Appendix K

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Appendix K
REFERENCES

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